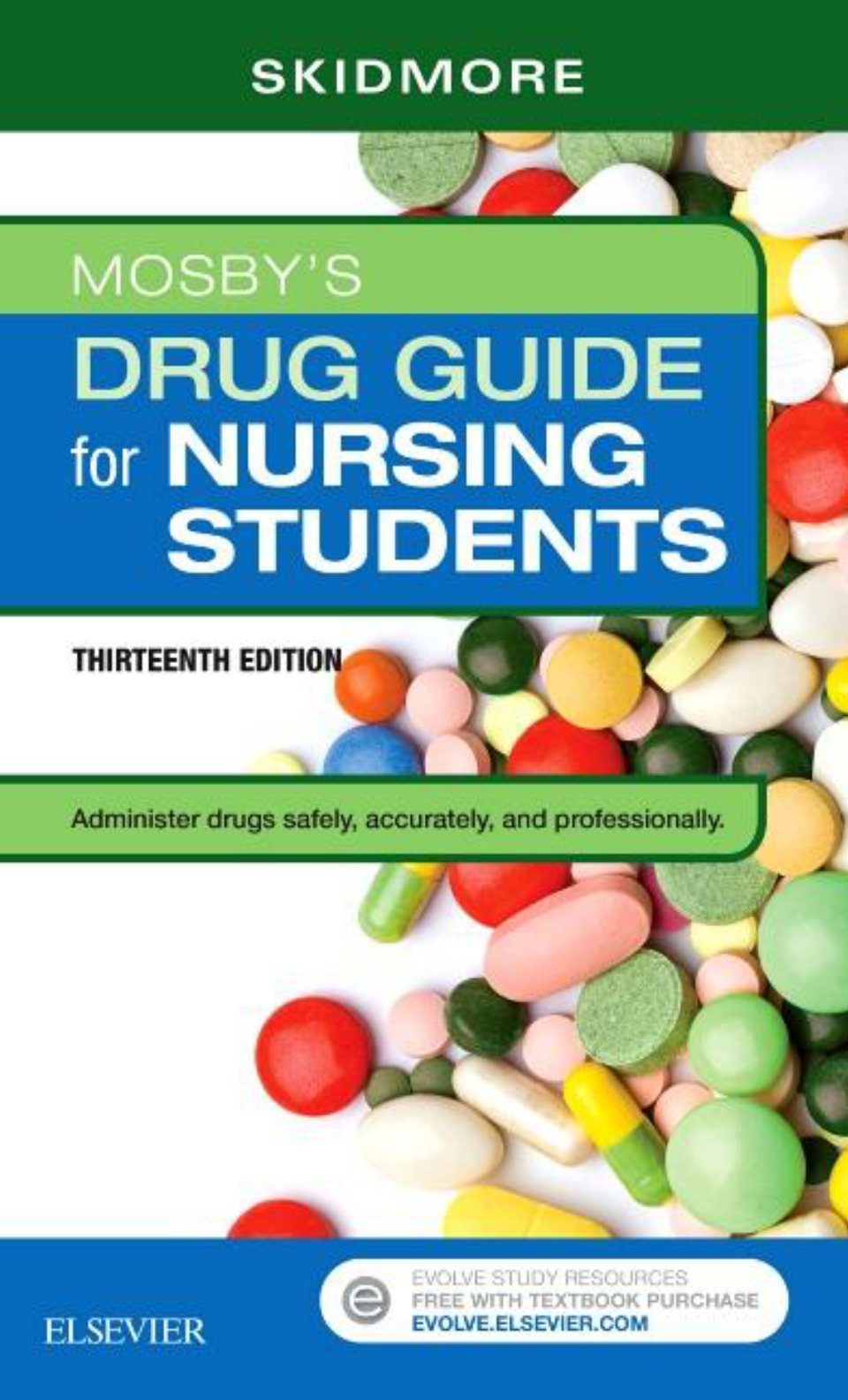
SKIDMORE

# MOSBY'S DRUG GUIDE for NURSING STUDENTS

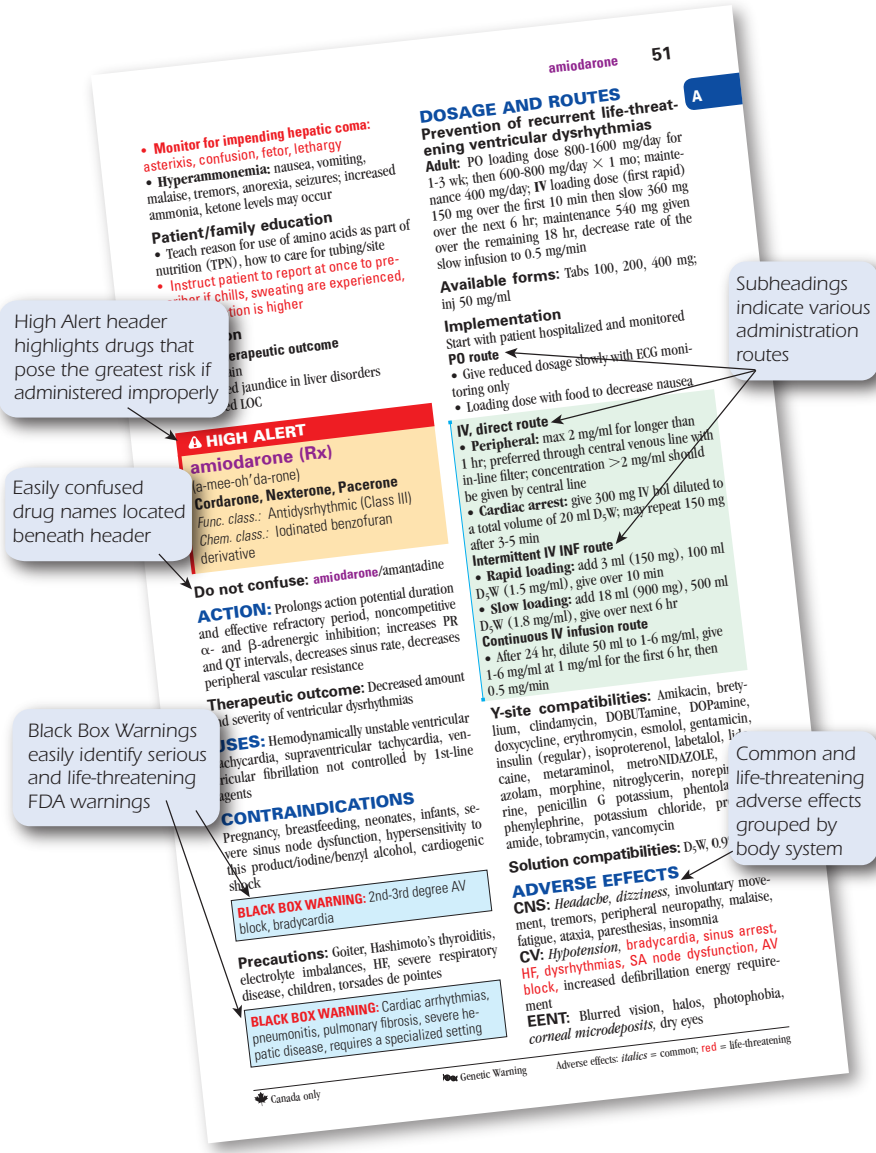
THIRTEENTH EDITION

Administer drugs safely, accurately, and professionally.



EVOLVE STUDY RESOURCES
FREE WITH TEXTBOOK PURCHASE
EVOLVE.ELSEVIER.COM

ELSEVIER


High Alert header highlights drugs that pose the greatest risk if administered improperly
Easily confused drug names located beneath header
Black Box Warnings easily identify serious and life-threatening FDA warnings
Subheadings indicate various administration routes
Common and life-threatening adverse effects grouped by body system
amiodarone 51
A
• Monitor for impending hepatic coma: asterixis, confusion, fetor, lethargy
• Hyperammonemia: nausea, vomiting, malaise, tremors, anorexia, seizures; increased ammonia, ketone levels may occur
Patient/family education
• Teach reason for use of amino acids as part of nutrition (TPN), how to care for tubing/site
• Instruct patient to report at once to prescriber if chills, sweating are experienced, elevation is higher
Therapeutic outcome
Resolution of jaundice in liver disorders
Improved LOC
HIGH ALERT
amiodarone (Rx)
(a-mee-oh'da-rone)
Cordarone, Nexterone, Pacerone
Func. class.: Antidysrhythmic (Class III)
Chem. class.: Iodinated benzofuran derivative
Do not confuse: amiodarone/amantadine
ACTION: Prolongs action potential duration and effective refractory period, noncompetitive α- and β-adrenergic inhibition; increases PR and QT intervals, decreases sinus rate, decreases peripheral vascular resistance
Therapeutic outcome: Decreased amount and severity of ventricular dysrhythmias
USES: Hemodynamically unstable ventricular tachycardia, supraventricular tachycardia, ventricular fibrillation not controlled by 1st-line agents
CONTRAINDICATIONS
Pregnancy, breastfeeding, neonates, infants, severe sinus node dysfunction, hypersensitivity to this product/iodine/benzyl alcohol, cardiogenic shock
BLACK BOX WARNING: 2nd-3rd degree AV block, bradycardia
Precautions: Goiter, Hashimoto's thyroiditis, electrolyte imbalances, HF, severe respiratory disease, children, torsades de pointes
BLACK BOX WARNING: Cardiac arrhythmias, pneumonitis, pulmonary fibrosis, severe hepatic disease, requires a specialized setting
DOSAGE AND ROUTES
Prevention of recurrent life-threatening ventricular dysrhythmias
Adult: PO loading dose 800-1600 mg/day for 1-3 wk; then 600-800 mg/day × 1 mo; maintenance 400 mg/day; IV loading dose (first rapid) 150 mg over the first 10 min then slow 360 mg over the next 6 hr; maintenance 540 mg given over the remaining 18 hr, decrease rate of the slow infusion to 0.5 mg/min
Available forms: Tabs 100, 200, 400 mg; inj 50 mg/ml
Implementation
Start with patient hospitalized and monitored
PO route
• Give reduced dosage slowly with ECG monitoring only
• Loading dose with food to decrease nausea
IV, direct route
• Peripheral: max 2 mg/ml for longer than 1 hr; preferred through central venous line with in-line filter; concentration >2 mg/ml should be given by central line
• Cardiac arrest: give 300 mg IV bol diluted to a total volume of 20 ml D5W; may repeat 150 mg after 3-5 min
Intermittent IV INF route
• Rapid loading: add 3 ml (150 mg), 100 ml D5W (1.5 mg/ml), give over 10 min
• Slow loading: add 18 ml (900 mg), 500 ml D5W (1.8 mg/ml), give over next 6 hr
Continuous IV infusion route
• After 24 hr, dilute 50 ml to 1-6 mg/ml, give 1-6 mg/ml at 1 mg/ml for the first 6 hr, then 0.5 mg/min
Y-site compatibilities: Amikacin, bretylium, clindamycin, DOBUTamine, DOPamine, doxycycline, erythromycin, esmolol, gentamicin, insulin (regular), isoproterenol, labetalol, lidocaine, metaraminol, metroNIDAZOLE, azolam, morphine, nitroglycerin, norepinephrine, penicillin G potassium, phentolamine, phenylephrine, potassium chloride, procainamide, tobramycin, vancomycin
Solution compatibilities: D5W, 0.9
ADVERSE EFFECTS
CNS: Headache, dizziness, involuntary movement, tremors, peripheral neuropathy, malaise, fatigue, ataxia, paresthesias, insomnia
CV: Hypotension, bradycardia, sinus arrest, HF, dysrhythmias, SA node dysfunction, AV block, increased defibrillation energy requirement
EENT: Blurred vision, halos, photophobia, corneal microdeposits, dry eyes
Canada only
Genetic Warning
Adverse effects: italics = common; red = life-threatening

CYP3A4 inhibitors (barbiturates, protease inhibitors, rifamycins): decreased effect of chlordiazePOXIDE

### Drug/lab test

Increased: LFTs
False increase: 17-OHCS
False positive: pregnancy test (some methods)

## NURSING CONSIDERATIONS

### Assessment

- Assess **anxiety reaction:** inability to sleep, apprehension, dread, foreboding, or uneasiness related to unidentified source of danger
- Assess for previous **product dependence** or tolerance; if product dependent or tolerant, amount of medication should be restricted
- Monitor B/P (with patient lying, standing), pulse; if systolic B/P drops 20 mm Hg, hold product, notify prescriber
- Monitor hepatic studies: AST, ALT, bilirubin, creatinine, LDH, alkaline phosphatase during long-term therapy
- **Monitor mental status:** mood, sensorium, affect, sleeping patterns, drowsiness, dizziness, suicidal tendencies, paradoxical reactions such as excitement, stimulation, acute rage
- Assess for pregnancy, product should not be used during pregnancy or breastfeeding

### Patient/family education

- Instruct patient that product may be taken with food; if dose is missed take as soon as remembered; do not double doses
- Tell patient to avoid OTC preparations unless approved by prescriber; to avoid alcohol ingestion or other psychotropic medications unless directed by a prescriber, tolerance occurs
- Caution patient to avoid driving and activities requiring alertness, since drowsiness may occur; until medication response is known, tell patient that drowsiness may worsen at beginning of treatment
- Instruct patient not to discontinue medication abruptly after long-term use; product should be tapered over 1 wk
- Caution patient to rise slowly or fainting may occur, especially in geriatric
- Advise patient that product should be avoided during pregnancy
- Advise patient to report immediately suicidal thoughts/behaviors

### Evaluation

**Positive therapeutic outcome**

- Increased well being
- Decreased anxiety, restlessness, sleeplessness, dread
- Successful alcohol withdrawal

## TREATMENT OF OVERDOSE:

Lavage, VS, supportive care

## chloroquine (Rx)

(klor'oh-kwin)

**Aralen**

*Func. class.:* Antimalarial
*Chem. class.:* Synthetic 4-aminoquinoline derivative

**ACTION:** Inhibits parasite replications, transcription of DNA to RNA by forming complexes with DNA of parasite

**Therapeutic outcome:** Decreased symptoms of malaria, amebiasis

**USES:** Malaria caused by *P. vivax*, *Plasmodium malariae*, *P. ovale*, *Plasmodium falciparum* (so amebiasis

## CONTRAINDICATIONS

Hypersensitivity, retinal field changes

**Precautions:** Pregnancy, breastfeeding, children, blood dyscrasias, severe GI, neurologic disease, alcoholism, cardiac/hepatic disease, G6PD deficiency, psoriasis, eczema, seizures, preexisting auditory damage, infection, torsades de pointes, infection

## DOSAGE AND ROUTES

### Acute malaria attacks

**Adult:** **PO** 1000 mg (600 mg base), then 500 mg (300 mg base) in 6-8 hr, then 500 mg (300 mg base) q day × 2 days for a total of 2.5 g (1.5 g base) in 3 days

**Adult/adolescent of low body weight, child/infant:** **PO** 16.5 mg (10 mg base)/kg, max 600 mg base, then 8.3 mg (5 mg base)/kg max 300 mg base, 6 hr after 1st dose, then 8.3 mg (5 mg base)/kg, max 300 mg base 24 hr after 1st dose, then 8.3 mg (5 mg base)/kg max 300 mg base 36 hr after 1st dose

### Malaria prophylaxis (in areas with chloroquine–sensitive *P. falciparum*)

**Adult:** **PO** 500 mg (300 mg base) q wk on same day of each wk, starting 2 wk before travel and 8 wk after leaving

### Extraintestinal amebiasis

**Adult:** **PO** 1 g (600 mg base) q day × 2 days, then 500 mg (300 mg base) for ≥2-3 wk
**Child (unlabeled):** **PO** 16.6 mg (10 mg base)/kg (max 300 mg base) q day × 2-3wk

**Available forms:** Tabs 250 mg (150 mg base), 500 mg (300 mg base) phosphate



Canadian drugs identified with a maple-leaf icon

New genetic warning icon highlights drugs with genetic contraindications

Pediatric, geriatric, and other special dosages included throughout

evolve

ELSEVIER

# YOU'VE JUST PURCHASED MORE THAN A TEXTBOOK!

**Evolve Student Resources for *Skidmore-Roth: Mosby's Drug Guide for Nursing Students, Thirteenth Edition*, include the following:**

- High Alert Canadian Medications
- Canadian Controlled Substance Chart
- Vaccines Approved for Use in Canada
- Content Changes
- Drug Monographs—Additional Monographs
- Drug Monographs—Recently Approved



Activate the complete learning experience that comes with each textbook purchase by registering at

http://evolve.elsevier.com/nursingdrugupdates/Skidmore/NDG

REGISTER TODAY!

You can now purchase Elsevier products on Evolve!
Go to evolve.elsevier.com/html/shop/promo.html to search and browse for products.

2015v1.0

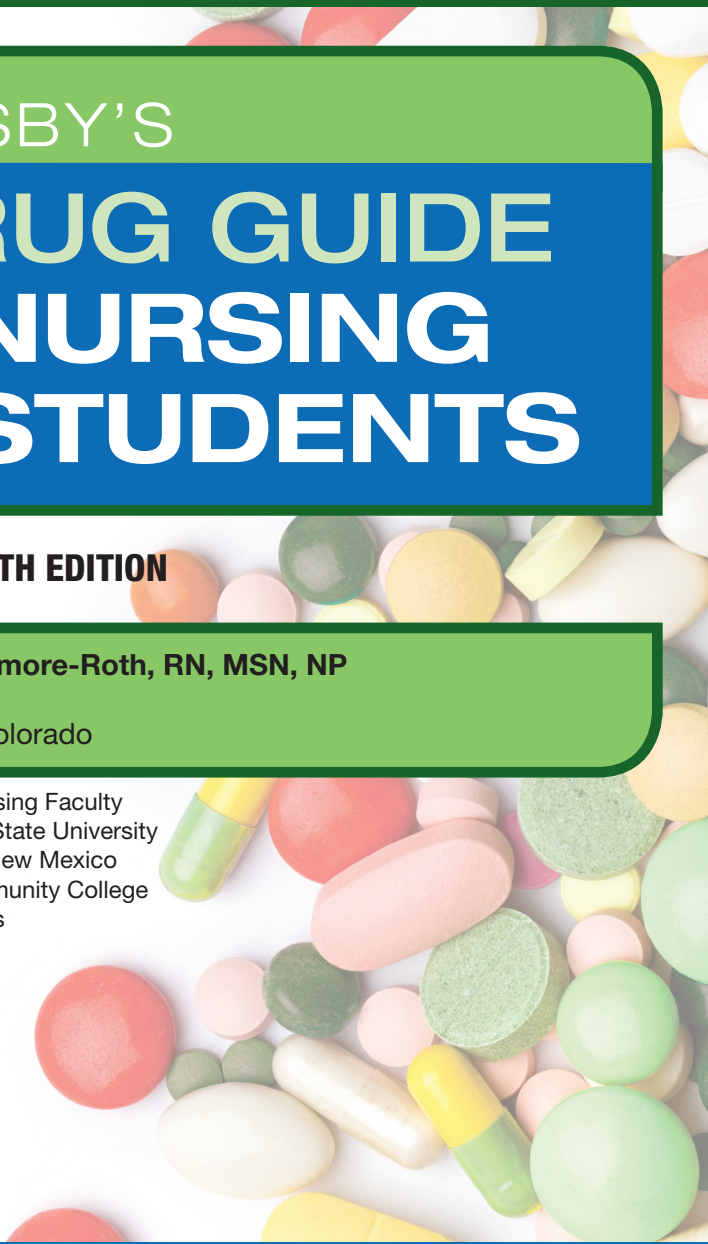
SKIDMORE

# MOSBY'S DRUG GUIDE for NURSING STUDENTS

THIRTEENTH EDITION

**Linda Skidmore-Roth, RN, MSN, NP**
Consultant
Littleton, Colorado

Formerly, Nursing Faculty
New Mexico State University
Las Cruces, New Mexico
El Paso Community College
El Paso, Texas



ELSEVIER

ELSEVIER

3251 Riverport Lane
St. Louis, Missouri 63043

MOSBY'S DRUG GUIDE FOR NURSING STUDENTS,
THIRTEENTH EDITION

ISBN: 978-0-323-61267-8
ISSN: 2213-4409

**Copyright © 2019, Elsevier Inc. All rights reserved.**
**Previous editions copyrighted 2017, 2015, 2013, 2011, 2009, 2007, 2005, 2003, 2001, 1999, 1997, 1996.**

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system, without permission in writing from the publisher. Details on how to seek permission, further information about the Publisher's permissions policies and our arrangements with organizations such as the Copyright Clearance Center and the Copyright Licensing Agency, can be found at our website: www.elsevier.com/permissions.

This book and the individual contributions contained in it are protected under copyright by the Publisher (other than as may be noted herein).

**Notices**

Knowledge and best practice in this field are constantly changing. As new research and experience broaden our understanding, changes in research methods, professional practices, or medical treatment may become necessary.

Practitioners and researchers must always rely on their own experience and knowledge in evaluating and using any information, methods, compounds, or experiments described herein. In using such information or methods they should be mindful of their own safety and the safety of others, including parties for whom they have a professional responsibility.

With respect to any drug or pharmaceutical products identified, readers are advised to check the most current information provided (i) on procedures featured or (ii) by the manufacturer of each product to be administered, to verify the recommended dose or formula, the method and duration of administration, and contraindications. It is the responsibility of practitioners, relying on their own experience and knowledge of their patients, to make diagnoses, to determine dosages and the best treatment for each individual patient, and to take all appropriate safety precautions.

To the fullest extent of the law, neither the Publisher nor the authors, contributors, or editors, assume any liability for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions, or ideas contained in the material herein.

**International Standard Book Number: 978-0-323-61267-8**

*Executive Content Strategist:* Sonya Seigafuse
*Director, Content Development:* Laurie Gower
*Content Development Specialist:* Elizabeth Kilgore
*Publishing Services Manager:* Jeff Patterson
*Project Manager:* Lisa A. P. Bushey
*Design Direction:* Ryan Cook

Printed in the United States of America

Last digit is the print number: 9 8 7 6 5 4 3 2 1



## Consultants

***Karen E. Alexander, PhD, RN, CNOR***
Director, RN-BSN Program, and Assistant Professor
Nursing
University of Houston—Clear Lake
Houston, Texas

***Abimbola Farinde, PhD, PharmD***
Professor, School of Nursing and Health Sciences
Columbia Southern University
Orange Beach, Alabama

***Dana Hamamura, PharmD, BCPC***
Clinical Pharmacist
University of Colorado Hospital
Aurora, Colorado

***Kathleen S. Jordan, DNP, MS, FNP-BC, ENP-BC, ENP-C, SANE-P***
Nurse Practitioner
Mid-Atlantic Emergency Medicine Associates
Clinical Assistant Professor
The University of North Carolina
Charlotte, North Carolina

***Janis McMillan, MSN, RN, CNE***
Associate Clinical Professor
School of Nursing
Northern Arizona University
Flagstaff, Arizona

***Meera K. Shah, PharmD, AAHIVP***
Clinical Pharmacist
University of Kansas Health Systems
Kansas City, Kansas

***Paula Denise Silver, BS Biology, PharmD***
Medical Instructor
School of Health Science
ECPI University
Newport News, Virginia

***Travis E. Sonnett, PharmD, FASCP***
Clinical Pharmacy Specialist/Inpatient Pharmacy Supervisor
Mann-Grandstaff VA Medical Center
Spokane, Washington
Adjunct Clinical Professor
Pharmacotherapy
Washington State University
Spokane, Washington

***Wm. Kendall Wyatt, MD, RN, EMTP***
Internal Medicine Resident Physician
West Virginia University
Charleston Area Medical Center
Charleston, West Virginia

## Preface

*Mosby's Drug Guide for Nursing Students,* thirteenth edition, is the most in-depth handbook available for nursing students! Since its first publication in 1996, more than 100 U.S. and Canadian pharmacists and consultants have reviewed the book's content closely. Today, *Mosby's Drug Guide for Nursing Students* is more up-to-date than ever—with features that make it easy to find critical information fast!

### NEW FEATURES

- Over 20 recent FDA-approved drugs for 2018 are located throughout the book and in Appendix A.

### NEW FACTS

This edition features thousands of new drug facts, including:

- New drugs and new dosage information
- Newly researched adverse effects
- Updated Black Box Warnings
- The latest precautions, interactions, and contraindications
- IV therapy updates
- Revised nursing considerations
- Updated patient/family education guidelines
- Updates on key new drug research

### ORGANIZATION

This handbook is organized into four main sections:

- Individual drug monographs (in alphabetical order by generic name)
- Drug Categories
- Appendixes
- Illustrated mechanisms and sites of action

The guiding principle behind this book is to provide fast, easy access to drug information and nursing considerations. Every detail—from the cover, binding, and paper to the typeface, four-color design, and appendixes—has been carefully chosen with the user in mind. Here's what you'll find in each section of the handbook:

#### Individual Drug Monographs

This book includes monographs for more than 4000 generic and trade medications—those most commonly administered by students. Common trade names are given for all drugs regularly used in the United States and Canada, with drugs available only in Canada identified by a maple leaf icon (🍁). Select monographs, important to learn and know for the NCLEX examination, have been identified by a ✳. You'll see drug-specific information within monographs identified with a >>. New icon highlights drugs that may have genetic contraindications 🧬.

Each monograph provides the following information, whenever possible, for safe, effective administration of each drug:

**High-alert status:** Identifies drugs with the most potential to cause harm to patients if administered incorrectly.

**"Tall Man" lettering:** Uses the capitalization of distinguishing letters to avoid medication errors and is required by the FDA for drug manufacturers.

**Pronunciation:** Helps the nurse master complex generic names.

**Rx, OTC:** Identifies prescription or over-the-counter drugs.

**Functional and chemical classifications:** Helps the nurse recognize similarities and differences among drugs in the same functional but different chemical classes.

**Do not confuse:** Presents drug names that might easily be confused within each appropriate monograph.

**Action:** Describes pharmacologic properties concisely.

**Therapeutic outcome:** Details all possible results of medication use.

**Uses:** Lists the conditions the drug is used to treat.

**Unlabeled uses:** Describes drug uses that may be encountered in practice but are not yet FDA approved.

**Dosages and routes:** Lists all available and approved dosages and routes for adult, pediatric, and geriatric patients.

**Available forms:** Includes tablets, capsules, extended release, injectables (IV, IM, SUBCUT), solutions, creams, ointments, lotions, gels, shampoos, elixirs, suspensions, suppositories, sprays, aerosols, and lozenges.

**Adverse effects:** Groups these reactions by alphabetical body system, with common side effects *italicized* and life-threatening reactions in red type for emphasis.

**Contraindications:** Lists conditions under which the drug absolutely should not be given.

**Precautions:** Lists conditions that require special consideration when the drug is prescribed.

**Black Box Warnings:** Identifies FDA warnings that highlight serious and life-threatening adverse effects.

**Pharmacokinetics/pharmacodynamics:** Features a quick-reference chart of concise facts of pharmacokinetics (absorption, distribution, metabolism, excretion, half-life) and pharmacodynamics (onset, peak, duration).

**Interactions:** Lists confirmed drug, food, herb, and lab test interactions.

**Nursing considerations:** Identifies key nursing considerations for each step of the nursing process: Assessment, Implementation, Patient/Family Education, and Evaluation, including positive therapeutic outcomes. Instructions for giving drugs by various routes (e.g., **IV**, PO, IM, SUBCUT, topically, rectally) appear under Implementation, with route subheadings in bold.

**Compatibilities:** Lists syringe, Y-site, and additive compatibilities and incompatibilities. If no compatibilities are listed for a drug, the necessary compatibility testing has not been done and that compatibility information is unknown. To ensure safety, assume that the drug may not be mixed with other drugs unless specifically stated.

**Treatment of overdose:** Lists drugs and treatments for overdoses where appropriate.

### Drug Categories

The Drug Categories section, following the individual drug monographs, provides general information about the various functional classes to promote learning about the similarities and differences among drugs in the same functional class. It summarizes action, uses, adverse effects, contraindications, precautions, pharmacokinetics, interactions, and nursing considerations for each functional class.

### Appendixes

**Selected new drugs:** Includes comprehensive information on 20+ key drugs approved by the FDA during the last 12 months.

**Ophthalmic, nasal, topical, and otic products:** Provides essential information for 140 ophthalmic, nasal, topical, and otic products commonly used today, grouped by chemical drug class.

**Vaccines and toxoids:** Features an easy-to-use table with generic and trade names, uses, dosages and routes, and contraindications for 39 key vaccines and toxoids.

**Abbreviations and pregnancy categories:** Lists abbreviations alphabetically with their meanings and explains the five FDA pregnancy categories.

**Immunization schedule:** Recommended childhood and adolescent immunization schedules.

**Standard Precautions:** Used in the care of all patients regardless of their diagnosis or disease.

**Illustrated mechanisms and sites of action:** These 13 detailed, full-color illustrations are added to help enhance the understanding of the mechanism or site of action for the following drugs and drug classes:

- Anticholinergic bronchodilators
- Antidepressants
- Antidiabetic agents
- Antifungal agents
- Antiinfective agents
- Antiretroviral agents
- Benzodiazepines
- Diuretics
- Laxatives
- Narcotic agonist-antagonist analgesics
- Narcotic analgesics
- Phenytoin
- Sympatholytics

**Photo atlas of drug administration:** This practical resource for students and practitioners lists standard precautions and provides more than 20 full-color illustrations depicting the physical landmarks and administration techniques used for IV, IM, SUBCUT, and ID drug delivery.

The following sources were consulted in the preparation of this edition:

Blumenthal M: *The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines,* Austin, 1998, American Botanical Council.

Brunton L, Lazo J, Parker K: *Goodman and Gilman's The Pharmacological Basis of Therapeutics,* ed 12, New York, 2011, McGraw-Hill.

*Clinical Pharmacology* powered by ClinicalKey [database online], Tampa Florida, 2016, Elsevier. https://www.clinicalkey.com/pharmacology/. Updated March 2018.

Gahart BL, Nazareno AR: *Intravenous Medications,* ed 29, St. Louis, 2013, Mosby.

McKenry LM, Tessier E, Hogan MA: *Mosby's Pharmacology in Nursing,* ed 22, St. Louis, 2006, Mosby.

## Acknowledgments

I am indebted to the nursing and pharmacology consultants who reviewed the manuscript and pages and thank them for their criticism and encouragement. I would also like to thank Laurie Gower and Elizabeth Kilgore, my editors, whose active encouragement and enthusiasm have made this book better than it might otherwise have been. I am likewise grateful to Lisa Bushey at Elsevier, and Evelyn Dayringer and Cassie Carey at Graphic World Inc., for the coordination of the production process and assistance with the development of the new edition, and to Craig Roth for his editorial assistance.

**Linda Skidmore-Roth**

## Contents


## INDIVIDUAL DRUG MONOGRAPHS, 1

## DRUG CATEGORIES, 1076

## APPENDIXES

A. Selected New Drugs, 1113
B. Ophthalmic, Nasal, Topical, and Otic Products, 1151
C. Vaccines and Toxoids, 1161
D. Abbreviations, 1165
E. Immunization Schedules, 1167
F. Standard Precautions, 1169
G. Illustrated Mechanisms and Sites of Action, 1170
H. Photo Atlas of Drug Administration, 1183

## INDEX, 1195

## EVOLVE WEBSITE CONTENTS

Canadian Resources
- Canadian Controlled Substance Chart
- Canadian Recommended Immunization Schedules for Infants and Children
- High Alert Canadian Medications

Content Changes
Drug Monographs—Additional Monographs
Drug Monographs—Recently Approved

This page intentionally left blank

A

⚠ HIGH ALERT

# abacavir (Rx)

(a-ba-ka'veer)

**Ziagen**

*Func. class.:* Antiretroviral

*Chem. class.:* Nucleoside reverse transcriptase inhibitor (NRTI)

**ACTION:** Inhibitory action against HIV; inhibits replication of HIV by incorporating into cellular DNA by viral reverse transcriptase, thereby terminating the cellular DNA chain

**Therapeutic outcome:** Decreased symptoms of HIV

**USES:** In combination with other antiretroviral agents for HIV-1 infection

## CONTRAINDICATIONS

**BLACK BOX WARNING:** Hypersensitivity, moderate to severe hepatic disease, lactic acidosis

**Precautions:** Pregnancy, breastfeeding, child <3 mo, granulocyte count <1000/mm$^3$ or Hgb <9.5 g/dl, severe renal disease, impaired hepatic function, HLA B5701 (Black, Caucasian, Asian patients), abrupt discontinuation; Guillain-Barré syndrome, immune reconstitution syndrome, MI, obesity, polymyositis

## DOSAGE AND ROUTES

**Adult/adolescent ≥16 hr:** PO 300 mg bid or 600 mg daily with other antiretrovirals

**Adolescent <16 yr/child ≥3 mo:** PO 8 mg/kg bid or 16mg/kg q day, max 300 mg bid with other antiretrovirals

### Hepatic dose

**Adult:** (Child-Pugh A 5-6) PO oral/sol 200 mg bid; moderate to severe hepatic disease, do not use

**Available forms:** Tabs 300 mg; oral sol 20 mg/ml

### Implementation

**PO route**

- Reduce dose in hepatic disease, use oral solution
- May give without regard to food q12hr around the clock
- Give in combination with other antiretrovirals with or without food; do not use triple therapy as a beginning treatment, resistance may occur
- Store in cool environment; protect from light, oral solution stored at room temperature; do not freeze

## ADVERSE EFFECTS

**CNS:** *Fever, headache, malaise, insomnia,* paresthesia

**GI:** *Nausea, vomiting, diarrhea, anorexia,* cramps, abdominal pain, *increased AST, ALT,* hepatotoxicity, hepatomegaly with steatosis

**HEMA:** Granulocytopenia, anemia, lymphopenia

**INTEG:** *Rash,* urticaria, hypersensitivity reactions

**META:** Lactic acidosis

**MISC:** Fatal hypersensitivity reactions, fat redistribution, immune reconstitution, decreased bone density

**RESP:** Dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid/extensive (PO) |
| **Distribution** | 50% protein binding, extravascular space, then erythrocytes |
| **Metabolism** | Extensively, to inactive metabolite |
| **Excretion** | Kidneys, feces |
| **Half-life** | 1½-2 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Do not coadminister with abacavir-containing products, ribavirin, interferon

Alcohol: increased abacavir levels; do not use with alcohol

**Ribavirin:** possible lactic acidosis

Methadone: decreased levels of methadone

Tipranavir: decreased abacavir levels

### Drug/lab test

Increased: glucose, triglycerides, AST, ALT, amylase, CK

## NURSING CONSIDERATIONS

### Assessment

- Assess for symptoms of HIV and possible infection, increased temp

**BLACK BOX WARNING: Assess for lactic acidosis** (elevated lactate levels, increased liver function tests) and severe hepatomegaly with steatosis; discontinue treatment and do not restart, women are at greater risk for lactic acidosis, those obese may be at greater risk

**BLACK BOX WARNING: Assess for fatal hypersensitivity reactions:** fever, rash, nausea, vomiting, fatigue, cough, dyspnea, diarrhea, abdominal discomfort; those with HLA-B 5701 are at greater risk, obtain genetic testing for HLA-B 5701 before beginning treatment; treatment should be discontinued and not restarted, register at the Abacavir Hypersensitivity Registry (800-270-0425)

- Autoimmune disorders: Monitor for Guillain-Barre's, Grave's disease, or polymyositis during treatment
- **Pregnancy/breastfeeding:** Register pregnant patients with the Antiretroviral Pregnancy Registry 1-800-258-4263, use only if benefits outweigh fetal risk, identify if pregnancy is planned or suspected, avoid breastfeeding
- Fat distribution: May occur during treatment, buffalo hump, breast growth, moon face, trunk obesity

**BLACK BOX WARNING:** Assess for pancreatitis: abdominal pain, nausea, vomiting, elevated liver enzymes; product should be discontinued because condition can be fatal

- Monitor CBC, differential, platelet count qmo; withhold product if WBC is $<4000/mm^3$ or platelet count is $<75{,}000/mm^3$; notify prescriber of results; monitor viral load and CD4 counts during treatment, perform hepatitis B virus (HBr) screening to confirm correct treatment
- Monitor renal function studies; BUN, serum uric acid, urine CCr before, during therapy; these may be elevated throughout treatment
- Monitor temp q4hr; may indicate beginning of infection

**BLACK BOX WARNING: Hepatotoxicity:** Monitor liver function tests before, during therapy (bilirubin, AST, ALT, amylase, alkaline phosphatase, creatine phosphokinase, creatinine prn or qmo)

- **Immune reconstitution syndrome:** may occur anytime during treatment; response to CMV, mycobacterium avium infection

## Patient/family education

- **Advise patient to report signs of infection:** increased temp, sore throat, flulike symptoms; to avoid crowds and those with known infections, to carry emergency ID with condition, products taken, do not take other products that contain abacavir
- Instruct patient to report signs of anemia: fatigue, headache, faintness, shortness of breath, irritability
- Advise patient to report bleeding; avoid use of razors or commercial mouthwash
- Inform patient that product is not a cure but will control symptoms
- Inform patient that major toxicities may necessitate discontinuing product
- Consider the use of contraception during treatment, if patient is pregnant, register with the Antiretroviral Pregnancy Registry, that body fat redistribution may occur, not to share product
- Caution patient to avoid OTC products or other medications without approval of prescriber, that other products may be necessary to prevent infections, and that product is taken with other products for HIV
- Caution patient not to have any sexual contact without use of a condom; needles should not be shared; blood from infected individual should not come in contact with another's mucous membranes
- Give Medication Guide and Warning Card; discuss points on guide
- Advise patient to notify prescriber if skin rash, fever, cough, shortness of breath, GI symptoms occur; advise all health care providers that allergic reactions have occurred with this product
- To use exactly as prescribed, not to drink alcohol, not to stop or change dose

## Evaluation

**Positive therapeutic outcome**

- Increased CD4 count
- Decreased viral load

## abatacept (Rx)

(ab-a-ta'sept)

**Orencia, Orencia ClickJet**

*Func. class.:* Antirheumatic agent (disease modifying)

*Chem class.:* immunomodulator

**Do not confuse:** Orencia/Oracea

**ACTION:** A selective costimulation modulator, inhibits production of T lymphocytes, inhibits tumor necrosis factor (TNF-α), interferon-γ, interleukin-2, which are involved in immune and inflammatory reactions

**Therapeutic outcome:** Decreased pain, inflammation in joints

**USES:** Polyarticular juvenile rheumatoid arthritis; acute chronic rheumatoid arthritis that has not responded to other disease-modifying agents; may use in combination with DMARDs; do not use with TNF antagonists (adalimumab, etanercept, infliximab) or anakinra

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, geriatric, recurrent infections, COPD, immunosuppression, neoplastic disease, respiratory infection, TB, viral hepatitis

## DOSAGE AND ROUTES

### Rheumatoid arthritis

**Adult: SUBCUT** 125 mg within a day after single IV loading dose, then 125 mg weekly, weekly subcut may be initiated without IV loading dose for those unable to receive an infusion

**Adult >100 kg (220 lb): IV** INF 1 g over 30 min; give at 2, 4 wk after first infusion, then q4wk

**Adult 60-100 kg (132-220 lb): IV** INF 750 mg over 30 min; give at 2, 4 wk after first infusion, then q4wk

**Adult <60 kg (132 lb): IV** INF 500 mg over 30 min; give at 2, 4 wk after first infusion, then q4wk

### Juvenile rheumatoid arthritis (JRA)/ juvenile idiopathic arthritis (JIA)

**Child/adolescent ≥6 yr >100 kg: IV** 1000 mg over 30 min q2wk × 3 doses, then 1 g over 30 min q4wk starting at wk 8

**Child/adolescent >6 yr >75 kg: IV** INF 750 mg over 30 min q2wk × 3 doses, then 750 mg over 30 min q4wk starting at wk 8

**Child/adolescent ≥6 yr <75 kg: IV** INF 10 mg/kg over 30 min q2wk × 2 doses, then 10 mg/kg q4wk starting at wk 8

### Moderate/severe polyarticular juvenile idiopathic arthritis as monotherapy with or without methotrexate

**Child/adolescent >2 yr and ≥ 50 kg:** SUBCUT 125 mg q wk

**Child/adolescent >2 yr and 25-50 kg:** SUBCUT 87.5 mg q wk

**Child/adolescent >2 yr and 10-25 kg:** SUBCUT 50 mg q wk

**Available forms:** Lyophilized powder, single-use vials 250 mg, sol for subcut injection 125 mg/ml

### Implementation

- Store in refrigerator; do not use expired vials, protect from light, do not freeze

**Intermittent IV infusion route**

- To **reconstitute,** use 10 ml of sterile water for injection; insert syringe needle into vial and direct stream of sterile water for inj on the wall of vial; rotate vial until mixed; vent with needle to rid foam after reconstitution 25 mg/ml; **further dilute** in 100 ml from a 100 ml NS infusion bag/bottle; withdraw the needed volume (2 vials remove 20 ml; 3 vials remove 30 ml, 4 vials remove 40 ml); slowly add the reconstituted sol from each vial into the infusion bag/bottle using the same disposable syringe supplied; mix gently, discard unused portions of vials; do not use if particulate is present or if discolored; **give** over 30 min; use non–protein binding filter (0.2-1.2 mcg)
- Do not admix with other sol or medications
- Store in refrigerator; do not use expired vials; protect from light

**Subcut route**

- Use prefilled syringe for subcut only, do not use for IV; allow syringe to warm to room temperature (30-60 min) do not speed up warming process; the amount of liquid should be between the two lines on the barrel, do not use the syringe if there is more or less liquid; use front of thigh, outer area of the upper arm, or abdomen except 2-inch area around the navel, do not inject into tender, bruised area
- Gently pinch skin and hold firmly, insert needle at 45-degree angle, inject full amount in 125 mg syringe, rotate injection sites
- Use ClickJet for SUBCUT only, let warm for 30 min after removal from refrigerator, do not use if damaged or past expiration date, pull cap straight off, push down on skin to unlock, push button and hold for 15 sec. A click will be heard, keep holding until blue indicator stops moving in the window, remove, tip will lock over needle

## ADVERSE EFFECTS

**CNS:** Headache, asthenia, dizziness

**CV:** *Hypertension, hypotension*

**GI:** Abdominal pain, dyspepsia, nausea, diarrhea, diverticulitis

**INTEG:** Rash, *inj site reaction,* flushing, urticaria, pruritus

**RESP:** *Pharyngitis, cough, URI,* non-URI, *rhinitis*, wheezing

**SYST:** Anaphylaxis, malignancies, angioedema, serious infections, antibody development

**GU:** Urinary tract infection, pyelonephritis

**MS:** Back pain

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown; steady state 60 days |
| **Metabolism** | Increased clearance in obesity (subcut); clearance increases with increased body weight |
| **Excretion** | Unknown |
| **Half-life** | Terminal IV 13 days, subcut 14.3 days |

### Pharmacodynamics
Unknown

## INTERACTIONS
### Individual drugs
Anakinra: do not use
Atropine, scopolamine, halothane: avoid concurrent use
Nitrous oxide: avoid concurrent use

### Drug classifications
Corticosteroids, immunosuppressives: avoid concurrent use, nitrous oxide
TNF antagonists (adalimumab, etanercept, inFLIXimab): do not use, infection may occur
Vaccines: do not give concurrently; immunizations should be brought up to date before treatment

## NURSING CONSIDERATIONS
### Assessment
- **RA:** Assess for pain, stiffness, ROM, swelling of joints during treatment
- Assess for latent/active TB before beginning treatment
- Assess for inj site pain, swelling
- Monitor patient's overall health on each visit; product should not be given with active infections; parenteral product contains maltose; glucose monitoring must be done with glucose-specific testing
- **Infection:** sinusitis, urinary tract infection, influenza, bronchitis, serious infections have occurred, notify provider, therapy may need to be changed
- **Pregnancy/breastfeeding:** Assess if pregnancy is planned or suspected, if pregnant, register by calling 877-311-8972, use only if benefits outweigh fetal risk, do not breastfeed

### Patient/family education
- Teach patient that product must be continued for prescribed time to be effective
- Advise patient to use caution when driving; dizziness may occur
- Advise patient not to have vaccinations while taking this product or use alcohol, TNF antagonists, other immunosuppressants; bring vaccinations up to date before use of this product
- Discuss with patient information included in packaging
- How to inject and rotate injection sites
- **Pregnancy/breastfeeding:** Teach patient to advise provider if pregnancy is suspected, if pregnant, enroll in registry, do not breastfeed
- Infection: report immediately, temperature, flulike symptoms, urinary burning/stinging, sinusitis; to avoid persons with known infections

### Evaluation
**Positive therapeutic outcome**
- Decreased inflammation, pain in joints; decreased erythrocyte sedimentation rate (ESR)

**⚠ HIGH ALERT**

# abiraterone
**Zytiga**
(a-bir-a'ter-one)
*Func Class.:* Antineoplastic
*Chem Class.:* Androgen inhibitor

**ACTION:** Converted to abiraterone, which inhibits CYP17, the enzyme required for androgen biosynthesis; androgen-sensitive prostate cancer responds to treatment that decreases androgens

**Therapeutic outcome:** Decreases spread of malignancy

**USES:** Metastatic castration-resistant prostate cancer in combination with prednisone in patients who have received prior chemotherapy containing docetaxel

## CONTRAINDICATIONS
Pregnancy, women, children

### Precautions
Adrenal insufficiency, cardiac disease, MI, heart failure, hepatic disease, hypertension, hypokalemia, infection, surgery, ventricular dysrhythmia

## DOSAGE AND ROUTES
**Adult Males: PO** 1000 mg q day with predniSONE 5 mg bid

### Hepatic dose
**Adult Males:** (Child-Pugh B, 7-9) PO 250 mg qday with predniSONE, permanently discontinue if AST/ALT >5 times of the upper normal limit (ULN) or total bilirubin >3 times (ULN); (Child-Pugh C, >10) do not use

**Available forms:** Tab 250 mg

### Implementation
**PO route**
- Give whole, on empty stomach two hrs before or 1 hr after meals with full glass of water
- Women who are pregnant or may become pregnant should not touch tabs without gloves
- Storage of tabs at room temperature

## ADVERSE EFFECTS
**CV:** Angina, dysrhythmia exacerbation, atrial flutter/fibrillation/tachycardia, AV block, chest pain, edema, heart failure, MI, hypertension, QT prolongation, sinus tachycardia, supraventricular tachycardia, ventricular tachycardia
**ENDO:** Hot flashes

**GI:** Diarrhea, dyspepsia, hepatotoxicity
**GU:** Increased urinary frequency, nocturia, urinary tract infection
**META:** Adrenocortical insufficiency, hyperbilirubinemia, hypertriglyceridemia, hypokalemia, hypophosphatemia
**MS:** Arthralgia, myalgia
**RESP:** Cough, upper respiratory infection
**SYST:** Infection

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Food increases effect; give on empty stomach; increased effect in hepatic disease |
| **Distribution** | 99% protein binding |
| **Metabolism** | Converted to abiraterone (active metabolite) |
| **Excretion** | 88% (feces), 5% (urine) |
| **Half-life** | Mean terminal half-life 12 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

CYP3A4 inducers (carBAMazepine, phenytoin, rifampin, rifabutin, rifapentine, PHENobarbital): decreased abiraterone effect
CYP2D6 substrates (dextromethorphan, thioridazine): increased action, dose of these products should be reduced, avoid concurrent use if possible

### Drug/Lab

Increase: ALT, AST, bilirubin, triglycerides
Decrease: Potassium, phosphate, testosterone, lymphocytes

### Drug/Food

Must be taken on an empty stomach, increased product effect if taken with food

## NURSING CONSIDERATIONS

### Assessment

- Prostate cancer: Monitor prostate-specific antigen (PSA), serum potassium, serum bilirubin
- Monitor liver function tests (AST/ALT) baseline and every 2 wk for 3 mo and monthly thereafter in those with no known hepatic disease; interrupt treatment in patients without known hepatic disease at baseline who develop ALT/AST >5 times ULN or total bilirubin >3 times ULN; in baseline moderate hepatic disease, measure ALT, AST, and bilirubin before the start of treatment, every week for the first month, every 2 weeks for the following 2 months, and monthly thereafter; if elevations in ALT and/or AST >5 times ULN or total bilirubin >3 times ULN occur in patients with baseline moderate hepatic impairment, discontinue and do NOT restart. Measure serum total bilirubin, AST, and ALT if hepatotoxicity is suspected. Elevations of AST, ALT, bilirubin from baseline should prompt more frequent monitoring.
- **Monitor musculoskeletal pain, joint swelling, discomfort:** Assess for arthritis, arthralgia, joint swelling, and joint stiffness, some severe. Muscle discomfort that included muscle spasms, musculoskeletal pain, myalgia, musculoskeletal discomfort, and musculoskeletal stiffness may be relieved with analgesics.
- Assess for signs and symptoms of adrenocorticoid insufficiency (anorexia, nausea, vomiting, fatigue, weight loss), corticosteroids may be needed during times of stress, surgery, trauma; monthly for hypertension, hypokalemia, and fluid retention
- **QT prolongation:** Monitor ECG for QT prolongation, ejection fraction in those with cardiac disease, small increases in the QTc interval such as <10 ms have occurred; monitor for arrhythmia exacerbation such as sinus tachycardia, atrial fibrillation, supraventricular tachycardia (SVT), atrial tachycardia, ventricular tachycardia, atrial flutter, bradycardia, AV block complete, conduction disorder, and bradyarrhythmia
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

- Teach patient that women must not come in contact with tabs, wear gloves if product needs to be handled, males need to wear condoms if partner is pregnant
- Instruct patient to report chest pain, swelling of joints, burning/pain when urinating
- Teach patient to take 2 hr before or 1 hr after meals, swallow whole, take with water, to use with predniSONE
- Advise patient not to stop abruptly without prescriber's consent
- Teach patient not to use with other medications, herbs, supplements without prescriber approval

**HIGH ALERT**

## acarbose (Rx)

(a-kar'bose)
**Glucobay, Prandase, Precose**
*Func. class.:* Oral antidiabetic
*Chem. class.:* α-Glucosidase inhibitor

**Do not confuse:** Precose/PreCare

**ACTION:** Delays the digestion/absorption of ingested carbohydrates by inhibiting α-glucosidase, results in a smaller rise in blood glucose after meals; does not increase insulin production

**Therapeutic outcome:** Decreased blood glucose levels in diabetes mellitus

**USES:** Type 2 diabetes mellitus, alone or in combination with a sulfonylurea, metformin, insulin

## CONTRAINDICATIONS

Hypersensitivity, breastfeeding, diabetic ketoacidosis, cirrhosis, inflammatory bowel disease, ileus, colonic ulceration, partial intestinal obstruction, chronic intestinal disease, serum creatinine >2 mg/dl

**Precautions:** Pregnancy, children, renal/hepatic disease

## DOSAGE AND ROUTES

### Initial dose

**Adult >60 kg (>132 lb):** PO 25 mg tid with first bite of meal

### Maintenance dose

**Adult:** PO May be increased to 50-100 mg tid; dosage adjustment at 4-8 wk intervals, individualized

**Adult <60 kg (<132 lb):** PO Max 50 mg tid

**Available forms:** Tabs 25, 50, 100 mg

### Implementation

- Give tid with first bite of each meal
- Provide storage in tight container in cool environment

## ADVERSE EFFECTS

**GI:** *Abdominal pain, diarrhea, flatulence*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Poor systemic |
| **Distribution** | Unknown |
| **Metabolism** | GI tract |
| **Excretion** | Kidneys as intact drug |
| **Half-life** | Elimination 2 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1 hr |
| **Duration** | 2-4 hr |

## INTERACTIONS

### Individual drugs

Acetaminophen: increased toxicity combined with alcohol, avoid concurrent use

Digoxin: decreased acarbose effect, monitor glucose level

Gatifloxacin: do not use concurrently

Phenytoin: increased hypoglycemia

Baclofen, cycloSPORINE, tacrolimus, isoniazid: increased hyperglycemia, monitor blood glucose

### Drug classifications

Androgens, quinolones: increased or decreased glycemic control

Calcium channel blockers, corticosteroids, diuretics, estrogens, oral contraceptives, phenothiazines, progestins, sympathomimetics: digestive enzymes, intestinal absorbents, thiazide diuretics, loop diuretics, corticosteroids, protease inhibitors, atypical antipsychotics, carbonic anhydrase inhibitors: increased hyperglycemia, decreased effect of acarbose, monitor for glucose control

MAOIs, salicylates, fibric acid derivatives, bile acid sequestrants, ACE inhibitors, angiotensin II receptor antagonists, β-blockers, sulfonylureas, insulins: increased hypoglycemia

### Drug/herb

Chromium, garlic, horse chestnut: increased hypoglycemia

### Drug/lab test

Increased: ALT

Decreased: calcium, vit $B_6$, Hgb , Hct

## NURSING CONSIDERATIONS

### Assessment

- **Assess for hypoglycemia** (weakness, hunger, dizziness, tremors, anxiety, tachycardia, sweating), hyperglycemia; even though this product does not cause hypoglycemia, if on a sulfonylurea or insulin, hypoglycemia may be additive; if hypoglycemia occurs, treat with glucose or if severe, **IV** dextrose or IM glucagon
- Monitor 1 hr postprandial glucose for establishing effectiveness, then glycosylated Hgb q3mo, 1 hr PP throughout treatment
- Monitor AST, ALT q3mo × 1 yr, and periodically thereafter, if elevated dose, may need to be reduced or discontinued, usually increased with doses ≥ 300 mg/day; dose-related elevations may occur, and patients are usually asymptomatic; if symptomatic, dosage reduction or withdrawal is needed; obtain glycosylated Hgb periodically
- Assess for stress, surgery, or other trauma that may require change in dose
- Assess for GI side effects, compliance
- **Pregnancy/breastfeeding:** Use in pregnancy only if needed, avoid breastfeeding

### Patient/family education

- Teach patient the symptoms of hypoglycemia, hyperglycemia, and what to do about each
- Instruct that medication must be taken as prescribed; must be taken with food; explain consequences of discontinuing the medication

abruptly; that insulin may need to be used during stress such as trauma, surgery, fever
• Tell patient to avoid OTC medications, herbal products unless approved by prescriber
• Teach patient that diabetes is a lifelong illness; product will not cure condition; that diet and exercise regimen must be followed
• Instruct patient to carry/wear emergency ID as diabetic
• Teach patient to avoid breastfeeding if using acarbose with other antidiabetics
• Inform that GI side effects may occur
• **Pregnancy/breastfeeding:** Notify provider if pregnancy is planned or suspected or if breast-feeding

### Evaluation

**Positive therapeutic outcome**
• Improved signs, symptoms of diabetes mellitus (decreased polyuria, polydipsia, polyphagia; clear sensorium, absence of dizziness, stable gait)

## acetaminophen (OTC) (Paracetamol)

(a-seat-a-mee′noe-fen)
**222AF, Abenol, ACET, Aceta, Acetab, Aminofen, Apacet, APAP, Apra, Atasol, Children's Feverall, Equaline Children's Pain Relief, Equaline Infant's Pain Relief, Exdol, Fortolin, Genapap, Good Sense Acetaminophen, Good Sense Children's Pain Relief, Infantaire, Leader Children's Pain Reliever, Mapap, Maranox, Meda, Neopap, Novo-Gesic, Ofirmev, Oraphen-PD, Pediaphen, Pediatrix, Q-Pap, Q-Pap Children's, Rapid Action Relief, Redutemp, Ridenol, Robigesic, Rounox, Silapap, Taminol, Tapanol, Tempra, T-Painol, Tylenol, Uni-Ace, Vick's Custom Care Body Aches, Walgreen's Acetaminophen, Walgreen's Non-Aspirin, XS Pain Reliever**
*Func. class.:* Nonopioid analgesic
*Chem. class.:* Nonsalicylate, paraaminophenol derivative

**Do not confuse:** Anacin Aspirin 3/Anacin-3

**ACTION:** May block pain impulses peripherally that occur in response to inhibition of prostaglandin synthesis; does not possess antiinflammatory properties; antipyretic action results from inhibition of prostaglandins in the CNS (hypothalamic heat-regulating center)

**Therapeutic outcome:** Decreased pain, fever

**USES:** Mild to moderate pain or fever; arthralgia, dental pain, dysmenorrhea, headache, myalgia, osteoarthritis

## CONTRAINDICATIONS

Hypersensitivity to this product or phenacetin

**Precautions:** Pregnancy, breast-feeding, geriatric, anemia, renal/hepatic disease, chronic alcoholism

**BLACK BOX WARNING:** Hepatotoxicity

## DOSAGE AND ROUTES

**Adult and child >12 yr:** PO/RECT 325-650 mg q4-6hr prn, max 4 g/day; weight ≥50 kg IV 1000 mg q6hr or 650 mg q4hr prn, max single dose 1000 mg, minimum dosing interval 4 hr; weight <50 kg IV 15 mg/kg/dose q6hr or 12.5 mg/kg/dose q4hr, max single dose 15 mg/kg minimum dosing interval 4 hr, max 75 mg/kg/day from all sources, ext rel 650-1300 mg q8hr as needed, max 4 g/day
**Child ≥2 yr and <50 kg:** IV 15 mg/kg/dose q6hr or 12.5 mg/kg/dose q4hr, max single dose 15 mg/kg, minimum dosing interval 4 hr, max 75 mg/kg/day from all sources

### Renal dose

**Adult:** IV CCr <30 ml/min reduce dose and prolong interval; CCr <10 ml/min PO/IM/IV minimal interval q8h

**Available forms:** Rectal supp 120, 325, 650 mg; chewable tabs 80 mg; caps 500 mg; elix 120, 160, 325 mg/5 ml; tabs 160, 325, 500, 650 mg; sol for injection 1000 mg/100 ml; disintegrating tab 80, 160 mg; oral drops 80 mg/10.8 ml; liquid 500 mg/5 ml, 160 mg/5 ml, 1000 mg/30 ml, 80 mg/ml; ext rel tabs 650 mg

### Implementation

**PO route**
• **Do not confuse:** 2 × 325 (650 mg), with 650 mg ER tab
• Administer to patient crushed or whole; chewable tabs may be chewed; do not crush or chew EXT REL product
• Give with food or milk to decrease gastric symptoms; give 30 min before or 2 hr after meals; absorption may be slowed
• Shake susp well; check all product concentrations carefully; check elixir, liquid, suspension concentration carefully; susp and cups are bioequivalent

**Intermittent IV infusion route**
• No further dilution needed, do not add other medications to vial or infusion device

- For doses equal to single vial, a vented IV set may be used to deliver directly from vial; for doses less than a single vial, withdraw dose and place in an empty sterile syringe, plastic IV container, or glass bottle, infuse over 15 mins
- Discard unused portion, once seal is broken or vial penetrated or transferred to another container, give within 6 hr
- Check IV dose carefully to prevent dosing errors

**Rectal route**

- Store suppositories <80° F (27° C)

## ADVERSE EFFECTS

**GI:** Nausea, vomiting, abdominal pain; hepatotoxicity, hepatic seizure (overdose), GI bleeding
**GU:** Renal failure (high, prolonged doses)
**HEMA:** Leukopenia, neutropenia, hemolytic anemia (long-term use), thrombocytopenia, pancytopenia
**INTEG:** Rash, urticaria, injection site pain
**SYST:** Stevens-Johnson syndrome, toxic epidermal necrolysis
**TOXICITY:** Cyanosis, anemia, neutropenia, jaundice, pancytopenia, CNS stimulation, delirium followed by vascular collapse, seizures, coma, death

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO), variable (RECT) |
| **Distribution** | Widely distributed; crosses placenta in low concentrations |
| **Metabolism** | Liver 85%-95%; metabolites are toxic at high levels |
| **Excretion** | Kidneys—metabolites, breast milk |
| **Half-life** | 3-4 hr |

### Pharmacodynamics

| | PO | RECT | IV |
|---|---|---|---|
| **Onset** | ½-1 hr | ½-1 hr | Unknown |
| **Peak** | 1-3 hr | 1-3 hr | 30-120 min |
| **Duration** | 3-4 hr | 3-4 hr | 3-4 hr |

## INTERACTIONS

### Individual drugs

Alcohol, carBAMazepine, dasatinib mipomersen, diflunisal, imatinib, isoniazid, lamoTRIgine, rifabutin, rifampin, zidovudine: increased hepatotoxicity
Colestipol, cholestyramine: decreased absorption of acetaminophen
Lomitapide: increase effect of lomitapide, consider a lower dose
Nitric oxide, pilocarpine: increased methoglobinemia, avoid concurrent use
Decrease: zidovudine, lamoTRIgine effect
Avoid use with salicylates
Warfarin: hypoprothrombinemia; long-term use, high doses of acetaminophen

### Drug classifications

Barbiturates, hydantoins: decreased effect; increased hepatotoxicity, monitor for hepatotoxicity
NSAIDs, salicylates: increased renal adverse reactions

### Drug/herb

St. John's wort: increased hepatotoxicity due to acetaminophen metabolism

### Drug/lab test

Interference: urinary 5-HIAA
Increased: LFTs, potassium, bilirubin, LDH, pro-time
Decreased: Hgb/Hct, WBC, RBC, platelets; albumin, magnesium, phosphate (pediatrics)

## NURSING CONSIDERATIONS

### Assessment

- **Monitor liver function studies:** AST, ALT, bilirubin, creatinine before therapy if long-term therapy is anticipated; may cause hepatic toxicity at doses >4 g/day with chronic use
- Monitor renal function studies: BUN, urine creatinine, occult blood; albumin indicates nephritis
- Monitor blood studies: CBC, PT if patient is on long-term therapy
- Check I&O ratio; decreasing output may indicate renal failure (long-term therapy)
- Assess for fever and pain: type of pain, location, intensity, duration, temp, diaphoresis
- **Assess for chronic poisoning:** rapid, weak pulse; dyspnea; cold, clammy extremities; report immediately to prescriber

**BLACK BOX WARNING: Assess hepatotoxicity:** dark urine, clay-colored stools, yellowing of skin and sclera; itching, abdominal pain, fever, diarrhea if patient is on long-term therapy; doses > 4 gm/day, may require liver transplant

- Stevens-Johnson syndrome, toxic epidermal necrolysis may occur when beginning treatment or any other dose
- Pregnancy/breastfeeding: Use cautiously in pregnancy, breastfeeding (PO), use only if clearly needed (IV)

A

### Patient/family education

**BLACK BOX WARNING:** Teach patient not to exceed recommended dosage; the elixir, liquid, and suspension come in several concentrations, read label carefully; acute poisoning with liver damage may result; acute toxicity includes symptoms of nausea, vomiting, and abdominal pain; prescriber should be notified immediately

- Inform patient that toxicity may occur when used with other combination products
- Advise patient not to use with alcohol, OTC products, or herbals without prescriber approval
- **Teach patient to recognize signs of chronic overdose:** bleeding, bruising, malaise, fever, sore throat
- Inform patient that urine may become dark brown as a result of phenacetin (metabolite of acetaminophen)
- Tell patient to notify prescriber for pain or fever lasting more than 3 days, not to be used in <2 yr unless approved by prescriber
- Hypersensitivity: Teach patient to stop product, notify provider if rash occurs

### Evaluation

**Positive therapeutic outcome**

- Decreased pain, use pain scoring
- Decreased fever

## TREATMENT OF OVERDOSE:

Product level q4hr, gastric lavage; administer oral acetylcysteine to prevent hepatic damage (*see acetylcysteine monograph*)

## acetaZOLAMIDE (Rx)

(a-set-a-zole'-a-mide)

**Diamox** 🍁, **Novo-zolamide** 🍁

*Func. class.:* Diuretic carbonic anhydrase inhibitor; antiglaucoma agent, antiepileptic

*Chem. class.:* Sulfonamide derivative

**Do not confuse:** acetaZOLAMIDE/ acetoHEXAMIDE, Diamox/Dobutrex/ Trimox

**ACTION:** Decreases the aqueous humor in the eye, which lowers intraocular pressure by the inhibition of carbonic anhydrase; also inhibits carbonic anhydrase activity in proximal renal tubules to decrease reabsorption of water, sodium, potassium, bicarbonate; decreases carbonic anhydrase in CNS, increasing seizure threshold; prevents uric acid or cysteine buildup in the renal system by the decrease in pH, causing increased urine volume and alkaline urine

**Therapeutic outcome:** Decreased intraocular pressure; control of seizures; prevention and treatment of acute mountain sickness; prevention of uric acid/cysteine renal stones; decreased edema in lung tissue and peripherally; decreased B/P

**USES:** Open-angle glaucoma, angle closure glaucoma (preoperatively if surgery delayed), mixed, tonic-clonic, myclonic, refractory, epilepsy (petit mal, grand mal, absence), edema in HF, product-induced edema, acute altitude sickness

## CONTRAINDICATIONS

Hypersensitivity to sulfonamides, severe renal/hepatic disease, electrolyte imbalances (hyponatremia, hypokalemia), hyperchloremic acidosis, Addison's disease, long-term use in closed-angle glaucoma, adrenalcortical insufficiency, metabolic acidosis, acidemia, anuria

**Precautions:** Pregnancy, breastfeeding, hypercalciuria, COPD, respiratory acidosis, pulmonary obstruction/emphysema

## DOSAGE AND ROUTES

### Angle closure glaucoma

**Adult:** PO/IV 250 mg q4hr or 250 mg bid, to be used for short-term therapy

### Chronic open-angle glaucoma

**Adult:** PO/IV 250 mg/day in divided doses for amounts over 250 mg or 500 mg EXT REL bid, max 1 g/day

**Child:** PO 8-30 mg/kg/day in divided doses tid or qid, or 300-900 mg/m$^2$/day, max 1 g/day; IV 5 to 10 mg/kg q6hr, max 1 g/day

### Edema in HF, drug-induced edema

**Adult:** PO/IV 250-375 mg/day or 5 mg/kg in AM, give for 2 days, then 1-2 days drug-free

**Child:** PO/IV 5 mg/kg/day or 150 mg/m$^2$ in AM

### Adjunct for epilepsy and myoclonic refractory generalized tonic-clonic absence or mixed seizures

**Adult:** PO/IV 8-30 mg/kg/day in 1-4 divided doses, usual range 375-1000 mg/day; EXT REL not recommended in seizures

### Altitude sickness

**Adult 125 mg bid/Child ≥ 12 yrs:** PO (Ext Rel) 500-1000 mg q12hr, start therapy 24-48 hr prior to ascent and ≥48 hr after arrival at high altitude

**Geriatric:** PO 250 mg bid; use lowest effective dose

### Renal dose

**Adult:** PO/IV CCr 50-80 ml/min, give dose ≥q6hr regular release of IV; CCr 10-50 ml/min, give dose q12hr; CCr <10 ml/min, avoid use

**Available forms:** Tabs 125, 250 mg; ext rel caps 500 mg; inj 500 mg

### Implementation

- Give in AM to avoid interference with sleep
- Administer fluids 2-3 L/day to prevent renal calculi, unless contraindicated
- Potassium replacement if potassium level is <3.0 ml/dl

**PO route**

- Do not crush or chew ext rel caps; caps may be opened and sprinkled on food; store at room temperature
- Give with food; if nausea occurs, crush tabs and mix with sweet substance to counteract bitter taste

**IV route**

- Do not use solution that is yellow or has a precipitate or crystals
- **Reconstitute with** 500 mg of product/5 ml or more sterile water for inj: use within 24 hr, **give** at 100-500 mg/min

**IV, direct route**

- Give at 100-500 mg/min or more
- Store in cool, dark area, use reconstituted solution within 24 hr

**Additive compatibilities:** Cimetidine, ranitidine

**Additive incompatibilities:** Multivitamins

## ADVERSE EFFECTS

**CNS:** Drowsiness, paresthesia, anxiety, depression, headache, dizziness, confusion, stimulation, fatigue, seizures

**EENT:** Myopia, tinnitus

**ENDO:** Hyperglycemia, hypoglycemia

**GI:** Nausea, vomiting, anorexia, diarrhea, melena, weight loss, hepatic insufficiency, cholestatic jaundice, fulminant hepatic necrosis, taste alterations, bleeding

**GU:** Frequency, polyuria, uremia, glucosuria, hematuria, dysuria, crystalluria, renal calculi

**HEMA:** Aplastic anemia, hemolytic anemia, leukopenia, thrombocytopenia purpura, pancytopenia

**INTEG:** Rash, pruritus, urticaria, fever, Stevens-Johnson syndrome, photosensitivity, flushing, toxic epidermal necrolysis

**META:** *Hypokalemia, hyperchloremic acidosis,* hyponatremia, sulfonamide-like reactions, metabolic acidosis, growth inhibition in children, hyperuricemia, hypercalcemia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | GI tract—65% if fasting, 75% with food; **IV**—complete |
| **Distribution** | Crosses placenta; widely distributed |
| **Metabolism** | None |
| **Excretion** | Kidneys, unchanged (80% within 24 hr); breast milk |
| **Half-life** | 2½-5½ hr |

### Pharmacodynamics

| | PO | PO—ext rel | IV |
|---|---|---|---|
| **Onset** | 1 hr | 2 hr | 2 min |
| **Peak** | 8-12 hr | 3-6 hr | 15 min |
| **Duration** | 8-12 hr | 18-24 hr | 4-5 hr |

## INTERACTIONS

### Individual drugs

Amphotericin B, corticotropin, ACTH: increased hypokalemia

Arsenic trioxide, levomethadyl: increased cardiac toxicity if hypokalemia develops

CarBAMazepine, ethotoin: increased osteomalacia

CycloSPORINE: increased toxicity

Diflunisal: increased side effects

Lithium: increased excretion of lithium, monitor drug level

Increase: acidosis (respiratory disorders) beta blockers

Methenamine: decreased acetaZOLAMIDE effect

Primidone: decreased primidone level, monitor drug level

Topiramate: increased renal stone formation, heat stroke, avoid concurrent use

### Drug classifications

Alpha blockers, beta blockers, antihypertensives: increased hypotensive effect

Amphetamines: increased action

Anticholinergics, folic acid antagonists: increased action of each product

Cardiac glycosides: increased cardiac toxicity if hypokalemia develops

Corticosteroids: increased hypokalemia

Flecainide, memantine, phenytoin, procainamide, quiNIDine, mecamylamine, mexiletine: increased effect of each product

Salicylates: increased toxicity

### Drug/lab test

Increased: glucose, bilirubin, calcium, uric acid

Decreased: thyroid iodine uptake, sodium, Hct/Hgb

False positive: urinary protein, 17-hydroxysteroids

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for tinnitus, hearing loss, ear pain; periodic testing of hearing is needed when high doses of this product are given by **IV** route
- **Assess for seizures:** type, location, duration; provide seizure precautions

• Assess fluid volume status: I&O ratio and record, count or weigh diapers as appropriate, distended neck veins, crackles in lung, color, quality, and specific gravity of urine, skin turgor, adequacy of pulses, moist mucous membranes, bilateral lung sounds, peripheral pitting edema; dehydration symptoms of decreasing output, thirst, hypotension, dry mouth, and mucous membranes should be reported
• Monitor electrolytes: potassium, sodium, calcium, magnesium; also include BUN, blood pH, ABGs, uric acid, CBC, blood glucose
• Assess B/P before and during therapy with patient lying, standing, and sitting as appropriate; orthostatic hypotension can occur rapidly
• Monitor blood, urine glucose in diabetic patients; glucose levels may be increased
• Assess for eye pain, change in vision when using product for intraocular pressure
• Assess neurologic status when using product for seizures
• **Assess for decreased symptoms of acute mountain sickness:** headache, nausea, vomiting, dizziness, fatigue, drowsiness, shortness of breath, insomnia
• **Beers:** Avoid in older adults unless safer alternative is not available; may cause ataxia, impaired psychomotor function
• **Pregnancy/breastfeeding:** Women who are pregnant should enroll in the AED Pregnancy Registry 888-233-2334; assess if pregnancy is planned or suspected or if breastfeeding, use in pregnancy only if benefits outweigh fetal risk

### Patient/family education

• Teach patient to take the medication early in the day to prevent nocturia
• Instruct patient to take with food or milk if GI symptoms of nausea and anorexia occur, not to crush, chew, or open capsules
• Teach patient to maintain a record of weight on a weekly basis and notify prescriber of weight loss of >5 lb
• Caution patient that this product causes a loss of potassium, so food rich in potassium should be added to the diet; refer to a dietitian for assistance in planning
• Advise patient to wear protective clothing and sunscreen in the sun to prevent photosensitivity
• Teach patient not to use alcohol or any OTC medications without prescriber's approval; serious product reactions may occur
• Emphasize the need to contact prescriber immediately if muscle cramps, weakness, nausea, dizziness, or numbness, rapid weight changes, change in stools, rash, sore throat, bleeding/bruising, Stevens-Johnson syndrome, toxic epidermal necrolysis (red rash that spreads, blistering) occur
• Avoid prolonged sun exposure
• Teach patient to take own B/P and pulse and record
• Teach patient to continue taking medication even if feeling better; this product controls symptoms but does not cure the condition
• Teach patient to see ophthalmologist periodically; glaucoma is a slow process
• Pregnancy/breastfeeding; Teach patient to notify prescriber if pregnancy is planned or suspected, avoid breastfeeding

### Evaluation

**Positive therapeutic outcome**
• Decreased intraocular pressure (glaucoma)
• Decreased edema in feet, legs, sacral area daily (HF)
• Decreased frequency of seizures
• Prevention of altitude sickness

**TREATMENT OF OVERDOSE:** Lavage if taken orally, monitor electrolytes, administer dextrose in saline, monitor hydration, CV, renal status

## acetylcholine ophthalmic

*See Appendix B*

## acetylcysteine (Rx)

(a-se-teel-sis'tay-een)
**Acetadote, Airbron, Cetylev, Mucomyst, Parvolex**
*Func. class.:* Mucolytic; antidote—acetaminophen
*Chem. class.:* Amino acid L-cysteine

**Do not confuse:** Mucomyst/Mucinex

**ACTION:** Decreases viscosity of secretions in respiratory tract by breaking disulfide links of mucoproteins; serves as a substrate of glutathione, which is necessary to inactivate toxic metabolites in acetaminophen overdose

**Therapeutic outcome:** Decreased hepatotoxicity from acetaminophen overdose (PO); decreased viscosity of mucus in respiratory disorders (inh)

**USES:** Acetaminophen toxicity, bronchitis, cystic fibrosis, COPD, atelectasis, meconium ileus

**CONTRAINDICATIONS**
Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, hypothyroidism, Addison's disease, CNS depression, brain tumor, asthma, renal/hepatic disease,

COPD, psychosis, alcoholism, seizure disorders, bronchospasms, asthma, anaphylactoid reactions, fluid restriction, weight <40 kg, increased intracranial pressure, status asthmaticus

## DOSAGE AND ROUTES

### Mucolytic

**Adult and child:** Instill 1-2 ml (10%-20% sol) q2-8hr prn, or 3-5 ml (20% sol) or 6-10 ml (10% sol) tid or qid; nebulization (face, mask, mouthpiece, tracheostomy) 1-10 ml of a 20% sol or 2-20 ml of a 10% sol q2-6hr; nebulization (tent, croupette) may require large dose, up to 300 ml/ contrast-induced nephrotoxicity (unlabeled) Adult PO 600-1200 mg bid × 2 days (beginning the day before the procedure)

### Diagnostic bronchial lab studies

**Adult/child:** Nebulizer 2-3 uses of 1-2 ml or a 20% solution or 2-4 ml of a 10% solution

### Tracheostomy care

**Adult/child:** Instill 1-2 ml of a 10% or 20% solution directly into the tracheostomy q1-4hr

### Acetaminophen toxicity

**Adult and child >40 kg:** PO 140 mg/kg, then 70 mg/kg q4hr × 17 doses to total 1330 mg/kg; **>40 kg IV** loading dose 150 mg/kg over 60 min (dilution 150 mg/kg in 200 ml $D_5W$); then 1:50 mg/kg over 4 hr (dilution 50 mg/kg in 500 ml $D_5$); then 2:100 mg/kg over 16 hr (dilution 100 mg/kg in 1000 ml $D_5W$)

**Child/Adolescents 21-40 kg:** IV 150 mg/kg in 100 ml of diluent over 1 hr, then 50 mg/kg in 250 ml over 4 hr, then 100 mg/kg in 500 mg over 16 hr

**Infants/Child 5-20 kg:** IV 150 mg/kg in 3 ml/kg diluent over 1 hr, then 50 mg/kg in 7 ml/kg diluent over 4 hr, then 100 mg/kg in 14 ml/kg diluent over 16 hr.

**Available forms:** Oral sol 10%, 20%; inj 20% (200 mg/ml); effervescent tab for solution 500, 2500 mg

### Implementation

- Give decreased dosage to geriatric patients; their metabolism may be slowed; give gum, hard candy, frequent rinsing of mouth for dryness of oral cavity
- Use only if suction machine is available

**PO route (Antidotal use)**

- Give within 24 hr; dilute 10% or 20% sol to a 5% sol with diet soda; may use water if giving via gastric tube; dilution of 10% sol 1:1, 20% sol 1:3; use within 1 hr, store open undiluted solution refrigerated ≤96 hr, repeat dose if vomited within 1 hr

**Direct intratracheal INSTILL**

- Use ½-1 hr before meals for better absorption to decrease nausea; only after patient clears airway by deep breathing, coughing
- Give by syringe 2-3 doses of 1-2 ml of 10%-20% sol up to q1hr
- Store in refrigerator: use within 96 hr of opening
- Provide assistance with inhaled dose: bronchodilator if bronchospasm occurs; wash face and rinse mouth after use to remove sticky feeling
- Use decreased dose in geriatric, metabolism may be slowed
- Use mechanical suction if cough insufficient to remove excess bronchial secretions
- Store in refrigerator; use within 96 hr of opening

**IV route**

**21-hr regimen:**

- **Loading dose: dilute** 150 mg/kg in 200 ml $D_5W$; maintenance dose no. 1 **dilute** 50 mg/kg in 500 ml $D_5W$; maintenance dose no. 2 **dilute** 100 mg/kg in 1000 ml $D_5W$
- **Give** loading over 15 min; **give** maintenance dose no. 1 over 4 hr; **give** maintenance dose no. 2 over 16 hr; **give** sequentially without time between doses

**Incompatibilities:** Rubber, metals, stability with other products unknown

## ADVERSE EFFECTS

**CNS:** Chills, *dizziness, drowsiness,* fever, headache
**CV:** Flushing, hypotension, tachycardia
**EENT:** *Rhinorrhea,* tooth damage
**GI:** Anorexia, constipation, diarrhea, hepatotoxicity, *nausea,* stomatitis, vomiting
**INTEG:** Clamminess, fever, pruritus, rash, urticaria
**MISC:** Anaphylaxis, angioedema, unpleasant odor
**RESP:** Bronchospasm, burning, chest tightness, cough, hemoptysis, dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Extensive (PO), locally (inh) |
| **Distribution** | Protein binding 83%<br>Peak ½-1 hr |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | 5.6 hr (adult), 11 hr (newborn) |

## INTERACTIONS

### Individual drugs

Do not use with acetylcysteine

## NURSING CONSIDERATIONS

### Assessment

**Mucolytic use**

- **Assess cough:** type, frequency, character, including sputum; bronchospasm
- **Assess characteristics, rate, rhythm of respirations,** increased dyspnea, sputum; discontinue if bronchospasm occurs; ABGs for increased $CO_2$ retention in asthma patients
- Monitor VS, cardiac status including checking for dysrhythmias, increased rate, palpitations

**Antidotal use**

- Use within 24 hr of acetaminophen toxicity, give within 10 hr of acetaminophen to minimize hepatotoxicity
- Assess liver function tests, acetaminophen levels, PT, glucose, electrolytes, BUN, creatinine; inform prescriber if dose is vomited or vomiting is persistent; 150 mg/kg may be toxic, check acetaminophen level q4hr; provide adequate hydration; decrease dosage in hepatic encephalopathy
- Assess for nausea, vomiting, rash; notify prescriber if these occur
- **Hypersensitivity:** Anaphylaxis may occur with IV dose; if present, stop infusion, treat, restart
- **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding, excretion unknown

### Patient/family education

**Mucolytic use**

- Inform patient that foul odor and smell may be unpleasant
- Instruct patient to clear airway for inhalation
- Teach patient to report vomiting, as dose may need to be repeated

### Evaluation

**Positive therapeutic outcome**

- Absence of purulent secretions when coughing (mucolytic use)
- Clear lung sounds bilaterally (mucolytic use)
- Absence of hepatic damage (acetaminophen toxicity)
- Decreasing blood toxicology (acetaminophen toxicity)

## acyclovir (Rx)

(ay-sye'kloe-veer)

**Avirat, Sitavig, Zovirax**

*Func. class.:* Antiviral

*Chem. class.:* Acyclic purine nucleoside analog

**Do not confuse:** Zovirax/Zyvox/Valtrex/Zostrix

**ACTION:** Converted to acyclovir monophosphate by virus-specific thymidine kinase, then further converted to acyclovir triphosphate by other cellular enzymes

**Therapeutic outcome:** Decreased amount and time of healing of lesions

**USES:** Mucocutaneous herpes simplex virus, herpes genitalis (HSV-1, HSV-2), varicella infections, herpes zoster, herpes simplex encephalitis

## CONTRAINDICATIONS

Hypersensitivity to this product or valacyclovir

**Precautions:** Pregnancy, breastfeeding, renal/hepatic disease, electrolyte imbalance, dehydration, neurologic disease; hypersensitivity to famciclovir, ganciclovir, penciclovir, valganciclovir, obesity

## DOSAGE AND ROUTES

Base dose in obese patients on ideal body weight, not actual weight

### Renal dose

**Adult and child:** PO/IV CCr >50 ml/min 100% dose q8hr; CCr 25-50 ml/min 100% dose q12hr; CCr 10-24 ml/min 100% dose q24hr; CCr 0-10 ml/min 50% of dose q24hr

Base dose in obese patients on ideal body weight, not actual body weight

### Herpes simplex (recurrent)

**Adult:** PO 400 mg 3 ×/day for 5 days or 200 mg 5 ×/day × 5 days

**Adult and child >12 yr (use ideal weight in obesity): IV** INF 5 mg/kg over 1 hr q8hr × 5 days

**Infant >3 mo/child <12 yr: IV** INF 10 mg/kg q8hr × 7 days; if HIV infected 5-10 mg/kg q8hr (moderate to severe)

**Neonate:** IV infusion 10mg/kg q8hr × 10 days, may use higher dose

### Genital herpes initial episode

**Adult:** PO 400 mg tid or 200 mg 5 times per day × 7-10 days, may extend treatment if healing is not complete after 10 days; topical 5 times per day

### Genital herpes, episodic treatment

**Adult:** PO 400 mg tid or 800 bid × 5 days or 800 mg × 2 days, initiate within 1 day of lesion onset

### Genital herpes, suppression therapy

**Adult:** PO 400 mg bid for up to 12 mo

### Genital herpes, initial limited, mucocutaneous HSV in immunocompromised patients, non-life-threatening

**Adult and child ≥12 yr:** TOP cover lesions q3hr 6 times/day

### Herpes simplex encephalitis
**Adult: IV** 10 mg/kg over 1 hr q8hr × 10 days
**Child 3 mo-12 yr: IV** 20 mg/kg q8hr × 10 days
**Child birth-3 mo: IV** 20 mg/kg q8hr × 21 days

### Herpes labialis, recurrent
**Adult and child ≥12 yr:** TOP apply cream 5 times a day × 4 days, start as soon as symptoms appear

### Herpes, labialis, recurrent in immunocompetent patients:
**Adult:** buccal 50 mg as a single dose in upper gum region within 1 hr after prodromal symptoms and before cold sore formation

### Herpes zoster (shingles): immunocompromised patients
**Adult and adolescent:** PO 800 mg q4hr 5 times/day × 7-10 days; **IV** 10 mg/kg q8hr × 7 days
**Child ≥12 yr: IV** 10 mg/kg q8hr × 7 days
**Infant and child <12 yr: IV** 20 mg/kg q8hr × 7-10 days

### Herpes zoster (shingles): immunocompetent patient
**Adult:** PO 800 mg q4hr 5 times/day × 7-10 days; start within 48-72 hr of rash onset; IV 10 mg/kg q8hr × 7 days

### Varicella (chickenpox): immunocompetent patient
**Adult, adolescent, and child:** PO 800 mg 4 times/day × 5 days
**Child ≥2 yr:** PO 20 mg/kg (max 800 mg) PO 4 times per day × 5 days

### Mucosal/cutaneous herpes simplex infections in immunosuppressed patients
**Adult and child >12 yr: IV** 5 mg/kg q8hr × 7 days
**Infant >3 mo/child <12 yr: IV** 10 mg/kg q8hr × 7 days

### Recurrent ocular herpes, prevention (unlabeled)
**Adult and child ≥12 yr:** PO 600-800 mg/day × 8-12 mo

**Available forms:** Caps 200 mg; tabs 400, 800 mg; powder for inj 500, 1000 mg; sol for inj 50 mg/ml; oral susp 200 mg/5 ml; ointment/cream 5%; buccal tab 50 mg

### Implementation
**PO route**
- Do not break, crush, or chew caps
- Give with food to lessen GI symptoms; may give without regard to meals with 8 oz of water
- Store at room temperature in dry place
- May be taken orally before infection occurs or when itching or pain occurs, usually before eruptions
- Must be taken at equal intervals around the clock
- Shake susp before use
- Buccal: use on the same side at the herpes labialis lesion, after removing tab from blister, place rounded side of tab to the upper gum above incisor tooth, hold in place for 30 sec, once adhered, the tab will dissolve, if tab fell off within 6 hr, reposition the same tab

**IV route**
- Provide increased fluids to 3 L/day to decrease crystalluria, most critical during first 2 hr after IV infusion

**Intermittent IV infusion route**
- Reconstitute with 10 ml sterile water for injection/500 mg of product (50 mg/ml); shake; **further dilute** in 50-125 ml compatible sol, use within 12 hr; **give** over at least 1 hr (constant rate) by infusion pump to prevent nephrotoxicity; do not reconstitute with sol containing benzyl alcohol or parabens; check infusion site for redness, pain, induration; rotate sites
- Lower dosage in acute or chronic renal failure
- Store at room temp for up to 12 hr after reconstitution; if refrigerated, sol may show a precipitate that clears at room temperature; yellow discoloration does not affect potency

**Y-site compatibilities:** Alemtuzumab, allopurinol, amikacin, aminophylline, amphotericin B cholesteryl, amphotericin B liposome, ampicillin, anidulafungin, argatroban, atracurium, bivalirudin, buprenorphine, busulfan, butorphanol, calcium chloride/gluconate, CARBOplatin, ceFAZolin, cefonicid, cefotaxime, cefOXitin, ceftAZidime, ceftizoxime, ceftRIAXone, cefuroxime, chloramphenicol, cholesteryl sulfate complex, cimetidine, clindamycin, dexamethasone sodium phosphate, dimenhyDRINATE, DOXOrubicin, doxycycline, erythromycin, famotidine, filgrastim, fluconazole, gentamicin, granisetron, heparin, hydrocortisone sodium succinate, HYDROmorphone, imipenem-cilastatin, LORazepam, magnesium sulfate, melphalan, methylPREDNISolone sodium succinate, metoclopramide, metroNIDAZOLE, multivitamin, nafcillin, oxacillin, PACLitaxel, penicillin G potassium, PENTobarbital, perphenazine, piperacillin, potassium chloride, propofol, ranitidine, remifentanil, sodium bicarbonate, teniposide, theophylline, thiotepa, ticarcillin, tobramycin, trimethoprim-sulfamethoxazole, vancomycin, vasopressin, voriconazole, zidovudine

**Y-site incompatibilities:** DOBUTamine, DOPamine, ondansetron, verapamil

**Topical route**
- Use finger cot or glove to cover all lesions completely, do not get in eye, wash hands after use

## ADVERSE EFFECTS

**CNS:** Tremors, confusion, lethargy, hallucinations, seizures, *dizziness, headache,* encephalopathic changes
**EENT:** Gingival hyperplasia
**GI:** Nausea, vomiting, diarrhea, increased ALT, AST, abdominal pain, glossitis, colitis
**GU:** Oliguria, proteinuria, hematuria, vaginitis, moniliasis, glomerulonephritis, acute renal failure, changes in menses, polydipsia
**HEMA:** Thrombotic thrombocytopenia purpura, hemolytic uremic syndrome (immunocompromised patient)
**INTEG:** Rash, urticaria, pruritus, pain or phlebitis at **IV** site, unusual sweating, alopecia, Stevens-Johnson syndrome
**MS:** Joint pain, leg pain, muscle cramps

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Minimal (PO) |
| **Distribution** | Widely distributed, crosses placenta; CSF concentration 50% plasma; protein binding 9%-33% |
| **Metabolism** | Liver, minimal |
| **Excretion** | Kidneys, 95% unchanged |
| **Half-life** | 2.0-3.5 hr, increased in renal disease |

### Pharmacodynamics

| | PO | IV | Buccal |
|---|---|---|---|
| **Onset** | Unknown | Rapid | |
| **Peak** | 2.5-3.3 hr | Infusion's end | 8 hr |
| **Duration** | Unknown | Unknown | |

## INTERACTIONS

### Individual drugs

Aminoglycosides: increased nephrotoxicity
Entecavir, PEMEtrexed, tenofovir, theophylline: increased concentration of each product
Probenecid: increased neurotoxicity, nephrotoxicity
Valproic acid: decreased action of valproic acid, monitor drug level
Zidovudine, IT methotrexate: increased CNS side effects

### Drug classifications

Hydantoins: decreased actions of hydantoins

## NURSING CONSIDERATIONS

### Assessment

- **Monitor for signs of infection,** type of lesions, area of body covered, purulent drainage
- Check I&O ratio; report hematuria, oliguria, fatigue, weakness; may indicate nephrotoxicity; check for protein in urine during treatment
- **Toxicity:** monitor any patient with compromised renal system, since product is excreted slowly in poor renal system function; toxicity may occur rapidly
- Monitor liver studies: AST, ALT
- **Monitor renal studies:** urinalysis, protein, BUN, creatinine, CCr; increased BUN, creatinine indicates renal failure and nephrotoxicity
- Monitor bowel pattern before, during treatment; if severe abdominal pain with bleeding occurs, product should be discontinued
- Assess allergies before treatment, reaction of each medication; place allergies on chart in bright red letters; allergic reaction: burning, stinging, swelling, redness, rash, vulvitis, pruritus
- Assess neurologic status in herpes encephalitis
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, use cautiously in pregnancy, avoid breastfeeding if lesions are around breasts

### Patient/family education

**PO route**

- Teach patient that product may be taken orally before infection occurs or when itching or pain occur, usually before eruptions; that partners need to be told that patient has herpes; they can become infected, so condoms must be worn to prevent reinfections
- Tell patient to report sore throat, fever, fatigue; may indicate superinfection; that product must be taken at equal intervals around the clock to maintain blood levels for duration of therapy
- Tell patient to notify prescriber of side effects: bruising, bleeding, fatigue, malaise; may indicate blood dyscrasias
- Adequate intake of fluids (2 L) to prevent deposits in kidneys, more likely to occur with rapid administration or in dehydration
- Tell patient to seek dental care during treatment to prevent gingival hyperplasia
- Teach female patients with genital herpes to have regular Pap smears to prevent undetected cervical cancer
- **Pregnancy/breastfeeding:** Teach patient to advise prescriber if pregnancy is planned or suspected or if breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Absence of itching, painful lesions
- Crusting and healed lesions
- Decreased symptoms of chicken pox

## TREATMENT OF OVERDOSE:

Discontinue product, hemodialysis, resuscitate if needed

## acyclovir topical

*See Appendix B*

## adalimumab (Rx)

(add-a-lim'yu-mab)

**Humira, Humira Pen**

*Func. class.:* Antirheumatic agent (disease modifying), immunomodulator, anti-TNF

**Do not confuse:** Humira/Humalin/Humalog/Humira Pen/Humapen Memoir

**ACTION:** A form of human IgG1 monoclonal antibody specific for human tumor necrosis factor (TNFα); elevated levels of TNFα are found in patients with rheumatoid arthritis

**Therapeutic outcome:** Decreased pain, inflammation in joints, better ROM

**USES:** Reduction in signs and symptoms and inhibiting progression of structural damage in patients with moderate to severe active rheumatoid arthritis in patients ≥18 years of age who have not responded to other disease-modifying agents, JRA, psoriatic arthritis, Crohn's disease, moderate-severe plaque psoriasis, ankylosing spondylitis, noninfectious uveitis

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, geriatric, CNS demyelinating disease, lymphoma, latent TB, HF, hepatitis B carriers, mannitol hypersensitivity, latex allergy, neoplastic disease, TB

**BLACK BOX WARNING:** Active infections, risk of lymphomas/leukemias

## DOSAGE AND ROUTES

### Rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis

**Adult:** SUBCUT 40 mg every other wk or every week if not combined with methotrexate

### Juvenile rheumatoid arthritis (JRA)

**Child ≥2 yr/adolescent ≥30 kg:** SUBCUT 40 mg every other wk

**Child ≥2 yr/adolescent ≥15 kg to <30 kg:** SUBCUT 20 mg every other wk

**Child ≥2 yr/adolescent 10 kg to <15 kg:** SUBCUT 10 mg every other wk

### Crohn's disease

**Adult:** SUBCUT 160 mg given as 4 inj on day 1, or 2 inj on days 1 and 2, then 80 mg at wk 2 and 40 mg every other wk, starting at wk 4

**Child > 6 yr and ≥40 kg (88 lb)** SUBCUT 160 mg day 1 (as 4 injections 40 mg or 40 mg as 2 injections) × 2 days then 80 mg after 2 wk (day 15 then 40 mg q other wk, day 29

**Child > 6 yr and 17-40 kg (37-88 lb)** SUBCUT 80 mg day 1 (as 2 injections then 40 mg after 2 wk (day 15) then 20 mg q other week (day 29)

### Plaque psoriasis/noninfectious uveitis

**Adult:** SUBCUT 80 mg baseline as 2 inj, then 40 mg every other week starting 1 wk after initial dose × 16 wk (plaque psoriasis)

**Available forms:** Inj 40 mg/0.8 ml; 20 mg/0.4 ml (pediatric)

### Implementation

**SUBCUT route**

- Do not admix with other sol or medications, do not use filter, protect from light
- Don't inject in bruised, red, tender areas

## ADVERSE EFFECTS

**CNS:** Headache, Guillain-Barré syndrome
**CV:** Hypertension, HF
**EENT:** Sinusitis
**GI:** Abdominal pain, nausea, hepatic damage, GI bleeding
**HEMA:** Leukopenia, pancytopenia, aplastic anemia, agranulocytopenia, thrombocytopenia
**INTEG:** Rash, *inj site reaction*
**MISC:** Flulike symptoms, UTI, hypertension, back pain, lupuslike syndrome, risk of cancer, antibody development to this drug, risk of infection (TB, invasive fungal infections, other opportunistic infections); may be fatal, Stevens-Johnson syndrome, anaphylaxis, hypercholesterolemia, hyperlipidemia
**RESP:** *URI,* pulmonary fibrosis, bronchitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Terminal 2 wk |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Anakinra: do not use together, serious infections may occur
Rilonacept: increase serious infections

### Drug classifications

Live-virus vaccines: do not give concurrently; immunization should be brought up to date before treatment

**BLACK BOX WARNING:** Other TNF blockers: increased serious infections

### Drug/lab test
Increased: ALT, cholesterol, lipids

## NURSING CONSIDERATIONS
### Assessment
- **Rheumatoid arthritis:** assess for pain, stiffness, ROM, swelling of joints during treatment
- Check for inj site pain, swelling, redness; usually occur after 2 inj (4-5 days) use cold compress to relieve pain/swelling
- Crohn's disease/ulcerative colitis: assess bowel pattern, cramping, abdominal pain, bleeding

**BLACK BOX WARNING:** Check for infections, fever, flulike symptoms, dyspnea, change in urination, redness/swelling around wounds, stop treatment if present, some serious infections, including sepsis, may occur; patients with active infections should not be started on this product

- May reactivate hepatitis B in chronic carriers, may be fatal

**BLACK BOX WARNING:** Assess for latent TB prior to therapy; treat before starting this product

- Assess for anaphylaxis, latex allergic; stop therapy if lupuslike syndrome develops
- Assess for blood dyscrasias: CBC, differential periodically

**BLACK BOX WARNING:** Assess for neoplastic disease (lymphomas/leukemia); in children, adolescents, hepatosplenic T-cell lymphoma is more likely in adolescent males with Crohn's disease or ulcerative colitis

- **Pregnancy/breastfeeding:** Use only if clearly needed, no well-controlled studies, cautious use in breastfeeding, excreted in breast milk

### Patient/family education
- Teach patient about self-administration if appropriate: inj should be made in thigh, abdomen, upper arm; rotate sites at least 1 inch from old site; do not inject in areas that are bruised, red, hard
- Advise patient that if medication is not taken when due, inject next dose as soon as remembered and inject next dose as scheduled
- Advise patient not to take any live-virus vaccines during treatment
- Instruct patient to report signs of infection, allergic reactions, lupuslike syndrome, immediately
- Teach patient to refrigerate the product, to dispose of needles and equipment as instructed

### Evaluation
**Positive therapeutic outcome**
- Decreased inflammation, pain in joints, decreased joint destruction

# adefovir (Rx)
(add-ee-foh'veer)
**Hepsera**
*Func. class.:* Antiviral Nucleoside

**ACTION:** Inhibits hepatitis B virus DNA polymerase by competing with natural substrates and by causing DNA termination after its incorporation into viral DNA; causes viral DNA death

**Therapeutic outcome:** Improving liver function tests, lessening symptoms of chronic hepatitis B

**USES:** Chronic hepatitis B

## CONTRAINDICATIONS
Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, geriatric, dialysis, females, labor, obesity, organ transplant

**BLACK BOX WARNING:** Severe renal disease, impaired hepatic disease, lactic acidosis, HIV, hepatitis B exacerbation

## DOSAGE AND ROUTES
**Adult/adolescent:** PO 10 mg daily, optimal duration unknown

### Renal dose
**Adult:** PO CCr ≥50 ml/min 10 mg q24hr; CCr 30-49 ml/min 10 mg q48hr; CCr 10-29 ml/min 10 mg q72hr; hemodialysis 10 mg q7 days following dialysis

**Available forms:** Tabs 10 mg

### Implementation
- Give by mouth without regard to food
- Store in cool environment; protect from light
- Take with full glass of water

## ADVERSE EFFECTS
**CNS:** *Headache*
**GI:** *Dyspepsia,* abdominal pain, nausea, vomiting, diarrhea, hepatomegaly, flatulence, pancreatitis
**GU:** Hematuria, glycosuria, nephrotoxicity, Fanconi syndrome, renal failure
**MISC:** Fever, rash, weight loss, cough

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly from GI tract |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys 45% |
| **Half-life** | 7.48 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1¾ hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

AMILoride, cimetidine, cycloSPORINE, digoxin, dofetilide, efavirenz, emtricitabine, memantine, metformin, midodrine, morphine, PEMEtrexed, procainamide, quiNIDine, quinine, ranitidine, tacrolimus, tenofovir, triamterene, trospium, vancomycin: increased serum concentrations, nephrotoxicity

Do not use in combination with emtricitabine/tenofovir, emtricitabine/rilpivirine, emtricitabine/efavirenz/tenofovir, hepatotoxicity/lactic acidosis may occur

### Drug classifications

Benzodiazepines, nucleoside analogs (experimental), NSAIDs, sulfonamides: increased serum concentrations, toxicity

**BLACK BOX WARNING:** Lactic acidosis, severe hepatomegaly, NNRTIs, NRTIs, antiretroviral protease-inhibitors, aminoglycosides

### Drug/lab test

Increased: ALT, AST, amylase, creatine kinase
Decreased: Phosphorus

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Assess **nephrotoxicity:** increasing CCr, BUN

**Pregnancy:** Pregnant women should call the Antiretroviral Pregnancy Registry (800-258-4263) for monitoring fetal outcome, use only if benefits outweigh fetal risk, do not breastfeed, excretion unknown

**BLACK BOX WARNING:** Assess for HIV antibody testing before beginning treatment because HIV resistance may occur in chronic hepatitis B patients

**BLACK BOX WARNING:** Assess **lactic acidosis,** severe hepatomegaly with stenosis, more common in females, obesity, and prolonged nucleoside use

- Assess geriatric patients more carefully; may develop renal, cardiac symptoms more rapidly

**BLACK BOX WARNING:** Assess exacerbations of **hepatitis** after discontinuing treatment, monitor liver function tests, hepatitis B serology

### Patient/family education

- Advise patient that optimal duration of treatment is unknown, that drug is not a cure; transmission may still occur
- Advise patient to avoid use with other medications unless approved by prescriber
- Advise patient to notify prescriber of decreased urinary output
- Teach patient not to stop abruptly unless directed, worsening of hepatitis may occur
- Teach patient to report immediately dyspnea, nausea, vomiting, abdominal pain, weakness, dizziness, cold extremities
- Teach patient to notify prescriber if pregnancy is planned or suspected, avoid breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Decreased symptoms of chronic hepatitis B, improving liver function tests

**⚠ HIGH ALERT**

## adenosine (Rx)

(ah-den'oh-seen)
**Adenocard, Adenoscan**
*Func. class.:* Antidysrhythmic—miscellaneous
*Chem. class.:* Endogenous nucleoside

**ACTION:** Slows conduction through AV node, can interrupt reentry pathways through AV node, and can restore normal sinus rhythm in patients with paroxysmal supraventricular tachycardia (PSVT), decreases cardiac oxygen demand decreasing hypoxia

**Therapeutic outcome:** Normal sinus rhythm in patients diagnosed with SVT or diagnosis of perfusion defect

**USES:** PSVT, as a diagnostic aid to assess myocardial perfusion defects in CAD; Wolff-Parkinson-White (WPW) syndrome

## CONTRAINDICATIONS

Hypersensitivity, 2nd- or 3rd-degree heart block, AV block, sick sinus syndrome, bradycardia

**Precautions:** Pregnancy, breastfeeding, children, geriatric, asthma, atrial flutter, atrial fibrillation, ventricular tachycardia, bronchospastic lung disease, symptomatic bradycardia, bundle branch block, heart transplant, unstable angina, COPD, hypotension, hypovolemia, vascular heart disease, CV disease

## DOSAGE AND ROUTES

### Converting paroxysmal supraventricular tachycardia to sinus rhythm

**Adult and child >50 kg:** **IV** BOL 6 mg; if conversion to normal sinus rhythm does not occur within 1-2 min, give 12 mg by rapid **IV** BOL; may repeat 12 mg dose again in 1-2 min

**Infant and child <50 kg:** **IV** BOL 0.05 mg/kg; if not effective, increase dose by 0.05-0.1 mg/kg q2min to a max of 0.3 mg/kg/dose

**Neonate:** **IV** BOL: 0.05 mg/kg by rapid **IV** BOL, may increase by 0.05 mg/kg q2min, max 0.3 mg/kg/dose

**Available forms:** 3 mg/ml solution for injection

### Implementation

**IV, direct (bolus) route**

- Give **IV** BOL undiluted; give 6 mg or less by rapid inj; if using an **IV** line, use port near insertion site, flush with 0.9% NaCl (20 ml), then elevate arm
- Store at room temperature; sol should be clear; discard unused product

**Solution compatibilities:** $D_5LR$, $D_5W$, LR, 0.9% NaCl

## ADVERSE EFFECTS

**CNS:** Light-headedness, dizziness, arm tingling, numbness, headache

**CV:** Chest pain/pressure, atrial tachydysrhythmias, sweating, palpitations, hypotension, *facial flushing*, AV block, cardiac arrest, ventricular dysrhythmias, atrial fibrillation

**GI:** *Nausea,* metallic taste

**RESP:** *Dyspnea, chest pressure,* hyperventilation, bronchospasm (asthmatics)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete bioavailability |
| **Distribution** | Erythrocytes, cardiovascular endothelium |
| **Metabolism** | Liver, converted to inosine and adenosine monophosphate |
| **Excretion** | Kidneys |
| **Half-life** | 10 sec |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | Unknown |
| **Duration** | 1-2 min |

## INTERACTIONS

### Individual drugs

Caffeine, theophylline: decreased effects of adenosine, dose may need to be increased

CarBAMazepine: increased heart block

Digoxin, verapamil: increased ventricular fibrillation, monitor ECG

Dipyridamole: increased effects of adenosine, dose may need to be reduced

Smoking: increased tachycardia

### Drug/herb

Ginger: increased effect

Green tea, guarana: decreased effect

## NURSING CONSIDERATIONS

### Assessment

- **Assess cardiopulmonary status:** pulse, respiration, ECG intervals (PR, QRS, QT); check for transient dysrhythmias (PVCs, PACs, sinus tachycardia, AV block)
- Assess respiratory status: rate, rhythm, lung fields for crackles, watch for respiratory depression; bilateral crackles may occur in HF patient; if increased respiration, increased pulse occurs, product should be discontinued
- Assess CNS effects: dizziness, confusion, paresthesias; product should be discontinued
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected or if breastfeeding, use only if benefits outweigh fetal risk

### Patient/family education

- Tell patient to report facial flushing, dizziness, sweating, palpitations, chest pain, IV discomfort
- **Pregnancy/breastfeeding:** Teach patient to advise prescriber if pregnancy is planned or suspected or if breastfeeding, do not breastfeed

### Evaluation

**Positive therapeutic outcome**

- Normal sinus rhythm
- Diagnosis of perfusion defect

**⚠ HIGH ALERT**

## ado-trastuzumab (Rx)

(a'doe-tras-tooz'ue-mab)

**Kadcyla**

*Func. class.:* Antineoplastic-biologic response modifier

*Chem. class.:* Signal transduction inhibitor (STI), humanized anti-HER2 antibody

**Do not confuse:** ado-trastuzumab/trastuzumab

**ACTION:** Humanized anti-HER2 monoclonal antibody that is linked to DM1, a small molecule microtubular inhibitor. Once the antibody

is bound to the HER2 receptor, the complex is internalized and the DM1 is released to bind with tubulin to lead to apoptosis

**Therapeutic outcome:** Decrease in size of tumors

**USES:** Breast cancer, metastatic with overexpression of HER2, in patients who previously received trastuzumab and a taxane separately or in combination

## CONTRAINDICATIONS

Hypersensitivity to this product, Chinese hamster ovary cell protein, pregnancy

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Breastfeeding, children, acute bronchospasm, anticoagulants, Asian patients, asthma, cardiomyopathy/HF, COPD, extravasation, fever, hepatitis, human anti-human antibody, hypotension, neuropathy, hepatotoxicity, interstitial lung disease/pneumonitis; pulmonary disease, thrombocytopenia

**BLACK BOX WARNING:** Heart failure, hepatotoxicity

## DOSAGE AND ROUTES

**Adult: IV** 3.6 mg/kg over 30-90 min q3wk; give first infusion over 90 min; if tolerated, give over 30 min

### Dosage adjustments for toxicities

**Hepatotoxicity**

AST/ALT >5 to ≤20× ULN: withhold, resume at a reduced dose when AST/ALT is ≤5× ULN

- **First dose reduction:** reduce the dose to 3 mg/kg
- **Second dose reduction:** reduce the dose to 2.4 mg/kg
- **Requirement for further dose reduction:** discontinue

AST/ALT >20× ULN: discontinue

Total bilirubin >3 to ≤10× ULN: withhold; resume treatment at a reduced dose when total bilirubin recovers to ≤1.5

- **First dose reduction:** reduce the dose to 3 mg/kg
- **Second dose reduction:** reduce the dose to 2.4 mg/kg
- **Requirement for further dose reduction:** discontinue treatment

Total bilirubin >10× ULN: permanently discontinue

- Permanently discontinue treatment in patients with AST/ALT > 3× ULN and total bilirubin > 2× ULN
- Permanently discontinue treatment in patients diagnosed with nodular regenerative hyperplasia (NRH)
- **Left ventricular ejection fraction (LVEF) 40%-45% and decrease is <10% points from baseline:** continue treatment; repeat LVEF assessment within 3 wk
- **LVEF 40%-45% and decrease is ≥10% points from baseline:** withhold; repeat LVEF assessment within 3 wk; if LVEF remains ≥10% points from baseline, discontinue
- **LVEF < 40%:** withhold; repeat LVEF assessment within 3 wk; if LVEF remains <40%, discontinue
- **Symptomatic congestive heart failure (HF):** discontinue

**Thrombocytopenia**

Platelet count 25,000/mm³ to <50,000/mm³: withhold; resume treatment at same dose when platelet count recovers to ≥75,000/mm³

Platelet count <25,000/mm³: withhold; resume treatment at a reduced dose when platelet count recovers to ≥75,000/mm³

- **First dose reduction:** reduce the dose to 3 mg/kg
- **Second dose reduction:** reduce the dose to 2.4 mg/kg
- **Requirement for further dose reduction:** discontinue

**Pulmonary toxicity**

- Permanently discontinue in patients diagnosed with interstitial lung disease or pneumonitis

**Peripheral neuropathy**

- Withhold in patients experiencing grade 3 or 4 peripheral neuropathy; resume treatment upon resolution to ≤ grade 2

**Available forms:** Lyophilized powder 100, 160 mg

### Implementation

**IV route**

- Visually inspect for particulate matter and discoloration prior to use
- Give as IV infusion with a 0.22-micron in-line filter; do not administer as an IV push or bolus
- Use cytotoxic handling procedures; do not mix with, or administer as an infusion with, other IV products

**Reconstitution**

- Slowly inject 5 ml of sterile water for injection into each 100 mg vial, or 8 ml of sterile water for injection into each 160 mg vial, to yield a single-use solution of 20 mg/ml
- Direct the stream of sterile water toward the wall of the vial and not directly at the cake or powder

• Gently swirl the vial to aid in dissolution; do not shake
• After reconstitution, withdraw desired amount from the vial and dilute immediately in 250 ml of 0.9% sodium chloride; do not use dextrose 5% solution; gently invert the bag to mix the solution in order to avoid foaming
• The reconstituted single-use product does not contain a preservative. Use the diluted solution immediately or store at 2-8 °C (36-46 °F) for up to 24 hr after reconstitution; discard any unused drug after 24 hr. Do not freeze.

**IV infusion**

• Closely monitor for possible subcutaneous infiltration during drug administration
• First infusion: Give over 90 min. The infusion rate should be slowed or interrupted if the patient develops an infusion-related reaction. Patients should be observed for at least 90 min following the initial dose for fever, chills, or other infusion-related reactions. Permanently discontinue for life-threatening infusion-related reactions.
• Subsequent infusions: Administer over 30 min if prior infusions were well tolerated. The infusion rate should be slowed or interrupted if the patient develops an infusion-related reaction. Patients should be observed for at least 30 min after the infusion. Permanently discontinue for life-threatening infusion-related reactions

## ADVERSE EFFECTS

**CNS:** Dizziness, insomnia, neuropathy, chills, fatigue, fever, flushing, headache
**CV:** Heart failure, tachycardia
**EENT:** Blurred vision, conjunctivitis, stomatitis
**GI:** Diarrhea, nausea, vomiting, abdominal pain, constipation, dyspepsia, hepatotoxicity
**HEMA:** Anemia, bleeding, thrombocytopenia
**INTEG:** Rash
**MISC:** Elevated LFTs, hand-foot syndrome
**MS:** Arthralgia
**RESP:** Cough, dyspnea, bronchospasm, pneumonitis, interstitial lung disease
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 93% Protein binding |
| **Metabolism** | Liver |
| **Excretion** | Unknown |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Anticoagulants, 5% dextrose, platelets: avoid concurrent use
CYP3A4 inhibitors (clarithromycin, ketoconazole, ritonavir, saquinavir, atazanavir): Increased: ado-trastuzumab effect, avoid concurrent use
Do not give with other IV products

## NURSING CONSIDERATIONS

### Assessment

• Monitor liver function tests; CBC
• **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected or if breastfeeding, this product is contraindicated in pregnancy, do not breastfeed; enroll pregnant patient in Mother Pregnancy Registry 800-690-6720
• Monitor, HER2 overexpression, pregnancy test

**BLACK BOX WARNING:** HF, other cardiac symptoms: assess for dyspnea, coughing; gallop; obtain full cardiac workup including ECG, echo, MUGA, ejection fraction

• Monitor for symptoms of infection; may be masked by product
• CNS reaction: monitor LOC, mental status, dizziness, confusion

**BLACK BOX WARNING:** Monitor hypersensitive reactions, anaphylaxis

• **Infusion reactions that may be fatal:** monitor fever, chills, nausea, vomiting, pain, headache, dizziness, hypotension; discontinue product, monitor for infusion reactions during and for 1-1/2 hr after conclusion of infusion, slowing of infusion may be needed
• **Pulmonary toxicity:** monitor dyspnea, interstitial pneumonitis, pulmonary hypertension, ARDs: can occur after infusion reaction; those with lung disease may have more severe toxicity in those with pneumonitis, interstitial lung disease
• **Bleeding:** Monitor for bleeding, grade 3 or 4 bleeding with fatalities has occurred, check platelets baseline and before each dose
• **Hepatotoxicity:** Monitor LFTs baseline and before each dose, fatal liver damage may occur, reduced dose or discontinuing treatment may be required

**BLACK BOX WARNING:** Hepatic disease: may be fatal

### Patient/family education

- Teach patient to take acetaminophen for fever
- Teach patient to avoid hazardous tasks because confusion, dizziness may occur
- Teach patient to report signs of infection: sore throat, fever, diarrhea, vomiting, bleeding, decreased heart function/SOB with exertion, neuropathy, liver toxicity, to report weight gain, swelling of extremities, fatigue, coughing, bleeding
- Teach patient that emotional lability is common: to notify prescriber if severe or incapacitating
- Teach patient to use contraception while taking this product; and for additional 7 months after discontinuing this drug; to avoid breastfeeding
- Teach patient to report pain at infusion site

### Evaluation

**Positive therapeutic outcome**

- Decrease in size of tumors

## RARELY USED

## afatinib (Rx)

(a-fat'i-nib)

**Gilotrif**

*Func. class.:* Antineoplastic biologic response modifiers

*Chem. class.:* Signal transduction inhibitors (STIs), epidermal growth factor receptor tyrosine kinase inhibitor

**USES:** Treatment of non-small cell lung cancer whose tumors have epidermal growth factor receptor Exon 19 deletions or 21 substitution mutations

## CONTRAINDICATIONS

Pregnancy, hypersensitivity

## DOSAGE AND ROUTES

**Adult: PO** 40 mg/day

### Dosage adjustments for toxicities

**Hepatotoxicity**

AST/ALT >5 to ≤20×ULN: withhold; resume at a reduced dose when AST/ALT is ≤5× ULN:

- **First dose reduction:** reduce the dose to 3 mg/kg
- **Second dose reduction:** reduce the dose to 2.4 mg/kg
- **Requirement for further dose reduction:** discontinue

AST/ALT >20× ULN: discontinue

**Total bilirubin > 3 to ≤103 ULN:** withhold; resume treatment at a reduced dose when total bilirubin recovers to ≤1.5:

- **First dose reduction:** reduce the dose to 3 mg/kg
- **Second dose reduction:** reduce the dose to 2.4 mg/kg
- **Requirement for further dose reduction:** discontinue

Total bilirubin >10× ULN: permanently discontinue

- Permanently discontinue treatment in patients with AST/ALT >3× ULN and total bilirubin >2× ULN
- Permanently discontinue treatment in patients diagnosed with nodular regenerative hyperplasia (NRH)

Left ventricular ejection fraction *(LVEF) 40%-45% and decrease is <10% points from baseline:* continue treatment. Repeat LVEF assessment within 3 wk.

LVEF 40%-45% and decrease is ≥10% points from baseline: withhold; repeat LVEF assessment within 3 wk; if LVEF remains ≥10% points from baseline, discontinue

LVEF <40%: withhold; repeat LVEF assessment within 3 wk; if LVEF remains <40%, discontinue

Symptomatic congestive heart failure (HF): discontinue

**Thrombocytopenia**

Platelet count 25,000/mm³ to <50,000/mm³: withhold; resume treatment at same dose when platelet count recovers to $75,000 /mm³

Platelet count <25,000/mm³: withhold; resume treatment at a reduced dose when platelet count recovers to ≥75,000/mm³.

- **First dose reduction:** reduce the dose to 3 mg/kg
- **Second dose reduction:** reduce the dose to 2.4 mg/kg
- **Requirement for further dose reduction:** discontinue

**Pulmonary toxicity**

- Permanently discontinue in patients diagnosed with interstitial lung disease or pneumonitis

**Peripheral neuropathy**

- Withhold in patients experiencing grade 3 or 4 peripheral neuropathy. Resume treatment upon resolution to ≤ grade 2

## albiglutide

(al'-bi-gloo'-tide)

**Tanzeum**

*Func. class.:* Antidiabetic

*Chem. class.:* Incretin mimetic

**ACTION:** Binds and activates known human GLP-1 receptor, mimics natural physiology for self-regulating glycemic control

**USES:** Type 2 diabetes mellitus; once-weekly dosing

**Therapeutic outcome:** Decreasing blood glucose level, A1C; decreasing polydipsia, polyphagia

## CONTRAINDICATIONS

Hypersensitivity

**BLACK BOX WARNING:** Medullary thyroid carcinoma, multiple endocrine neoplasia syndrome type 2 (MEN-2), thyroid cancer

**Precautions:** Geriatric patients, severe renal/hepatic/GI disease, pancreatitis, vit D deficiency, breastfeeding, burns, children, colitis, diabetic ketoacidosis, infection, pseudomembranous colitis, surgery, thyroid disease, smoking, trauma, type 1 diabetes mellitus, vomiting

## DOSAGE AND ROUTES

**Adult: SUBCUT** 30 mg q7days at any time of day; may increase to 50 mg q7days if needed

**Available forms:** Prefilled pen powder for inj 30, 50 mg

### Implementation

• Store in refrigerator for unopened pen; may store at room temperature after opening for up to 30 days

**SUBCUT route**

• Give every 7 days (weekly); the dose can be given at any time of day without regard to meals

**Reconstitution of the pen:**

• The powder contained within the pen must be reconstituted before administration

• Twist the clear cartridge on the pen in the direction of the arrow until a "click" is heard. (You will also see a number "2" appear in the number window.) This action mixes the diluent with the powder

• Slowly and gently rock the pen side to side 5 times to mix. Do NOT shake the pen. Shaking the pen will cause foaming

• Patients using the product at home must wait 15 min for the 30-mg pen or 30 min for the 50-mg pen to ensure that the medicine is properly mixed and to avoid clogging the pen needle. In health care environments, a health care professional may have to wait up to 10 min after adding the diluent to see complete dissolution

• As long as the needle has not been attached, the pen can be used within 8 hr of reconstitution with the diluent

**Preparing the pen for injection:**

• Prime the pen before use

• Slowly rock the pen side to side 5 times. Do NOT shake; inspect for particulate matter; sol will be yellow in color and free of particles. A small amount of foam is normal

• Holding the pen upright, attach the supplied needle to the pen

• Tap the cartridge to bring bubbles to the top, remove bubbles by twisting until a number "3" appears in window. At the same time, the inj button will be automatically released from the bottom of the pen

• Once the needle is attached, the product must be administered immediately. The product can clog the needle if allowed to dry in the primed pen

**SUBCUT administration using the pen:**

• Inject SUBCUT into the thigh, abdomen, or upper arm. Once the needle is inserted, press the inj button until you hear a "click" and then hold the button for 5 additional sec to deliver the full dose.

• Inject SUBCUT into the thigh, abdomen, or upper arm, rotate sites to prevent lipodystrophy

## ADVERSE EFFECTS

**GI:** Nausea, vomiting, diarrhea, dyspepsia, gastroesophageal reflux, pancreatitis

**INTEG:** Serious injection-site reactions

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Steady state 4-5 wk |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 5 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 3-5 days, increased in renal disease |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Digoxin: decreased action of digoxin

Niacin, dextrothyroxine, triamterene: decreased efficacy

Disopyramide, alcohol: increased hypoglycemia

Tacrolimus, cycloSPORINE: increased hyperglycemia

### Drug classifications

ACE inhibitors, sulfonylureas, androgens, fibric acid derivatives: increased hypoglycemia

Phenothiazines, corticosteroids, anabolic steroids: increased hyperglycemia

Thiazide diuretics, estrogens, progestins, oral contraceptives, MAOIs: decreased efficacy

## NURSING CONSIDERATIONS

### Assessment

• Monitor blood glucose, A1C, during treatment to determine diabetes control
• Monitor CBC, renal studies (urinalysis, creatinine), baseline and periodically during treatment, report decreased blood counts, abnormal renal studies

**BLACK BOX WARNING:** Medullary thyroid carcinoma, multiple endocrine neoplasia syndrome 2 (MEN-2), thyroid cancer: Monitor patient closely

• **Pancreatitis:** Assess for severe abdominal pain, with or without vomiting, product should be discontinued
• Assess for Hypo/hyperglycemic reaction that can occur soon after meals; for severe hypoglycemia, give **IV** D50W, then **IV** dextrose sol
• Monitor for nausea, vomiting, diarrhea, ability to tolerate product; may cause dehydration

### Patient/family education

• Teach patient the symptoms of hypo/hyperglycemia and what to do about each; to have glucagon emergency kit available, carry sugar packets
• Advise patient that product must be continued on a weekly basis, explain consequences of discontinuing product abruptly; to take only as directed
• Direct patient to avoid OTC products unless approved by prescriber
• Teach patient that diabetes is a life-long illness; product will not cure diabetes
• Advise patient to carry emergency ID with prescriber, condition, and medications taken
• **Pancreatitis:** If severe abdominal pain with or without vomiting occurs seek medical attention immediately
• Advise patient to continue weight control, dietary restrictions, exercise, hygiene
• Teach patient that regular blood glucose monitoring and A1C testing is needed
• Teach patient to notify prescriber if pregnant or intending to become pregnant (**C**)
• Advise patient that it is important to read "Information for the Patient" and "Pen User Manual"; about self-injection
• Teach patient to review inj procedure before use, dispose of pen appropriately

### Evaluation

**Positive therapeutic outcome**

• Improving blood glucose level, A1C; decreasing polydipsia, polyphagia, polyuria, clear sensorium, absence of dizziness

## RARELY USED

## albumin, human 5% (Rx)

(al-byoo'min)
**Albumarc, Albuminar-5, Albutein 5%, Buminate 5%, Plasbumin-5**

## albumin, human 25% (Rx)

Albuminar-25, Albutein 25%, Buminate 25%, Plasbumin-25
*Func. class.:* Blood derivative—plasma volume expander

**USES:** Restores plasma volume in burns, hyperbilirubinemia, shock, hypoproteinemia, prevention of cerebral edema, cardiopulmonary bypass procedures, ARDS, hemorrhage; also replacement in nephrotic syndrome

## CONTRAINDICATIONS

Hypersensitivity, HF, severe anemia, renal insufficiency, pulmonary edema

## DOSAGE AND ROUTES

### Burns

**Adult:** **IV** dose to maintain plasma albumin at 3-4 mg/dl

### Hypovolemic shock

**Adult:** **IV** Rapidly give 5% sol; when close to normal, infuse at ≤2-4 ml/min; 25% sol ≤1 ml/min
**Child:** 0.5-1 g/kg/dose, 5% sol, may repeat as needed; max 6 g/kg/day

### Nephrotic syndrome

**Adult:** **IV** 100-200 mg of 25% and loop diuretic × 7-10 days

### Hypoproteinemia

**Adult:** **IV** 25 g, may repeat in 15-30 min, or 50-75 g of 25% albumin infused at ≤2 ml/min
**Child/infant:** **IV** 0.5-1 g/kg/dose over 2-4 hr, may repeat q1-2days

### Hyperbilirubinemia/erythroblastosis fetalis

**Child:** **IV** 1 g/kg 1-2 hr before transfusion

## albuterol (Rx)

(al-byoo'ter-ole)
**AccuNeb, Salbutamol, Airomir, ProAir HFA, ProAir RespiClick, Proventil, Proventil HFA, ReliOn, Ventolin HFA, Vospire ER**
*Func. class.:* Bronchodilator
*Chem. class.:* Adrenergic $\beta_2$-agonist, sympathomimetic, bronchodilator

**Do not confuse:** albuterol/atenolol/Albutein, Proventil/Prinivil, Ventolin/Vantin

**ACTION:** Causes bronchodilation by action on $\beta_2$ (pulmonary) receptors by increasing levels of cyclic AMP, which relaxes smooth muscle; produces bronchodilatation; CNS, cardiac stimulation, increased diuresis, and increased gastric acid secretion; longer acting than isoproterenol

**Therapeutic outcome:** Increased ability to breathe because of bronchodilation

**USES:** Prevention of exercise-induced asthma, acute bronchospasm, bronchitis, emphysema, bronchiectasis, reversible airway obstruction

**Unlabeled uses:** Hyperkalemia in dialysis patients, COPD, emphysema

## CONTRAINDICATIONS

Hypersensitivity to sympathomimetics

**Precautions:** Pregnancy, breastfeeding, exercise-induced bronchospasm (aerosol) in children <12 yr, cardiac/renal disease, hyperthyroidism, diabetes mellitus, hypertension, prostatic hypertrophy, closed-angle glaucoma, seizures, hypoglycemia, tachydysrhythmias, severe cardiac disease, heart block

## DOSAGE AND ROUTES

### Bronchospasm, prophylaxis/treatment

**Adult and child ≥4 yr:** INH (metered dose inhaler) 2 puffs (180 mcg) q4-6hr prn; Powdered inhaler (ProAir RespiClick) >12 yrs 180 mcg (2 INH) q4-6hr as needed

**Adult/child ≥ 13 yr:** PO-EXT REL 4-8 mg q12h, max 32 mg/day; PO 2-4 mg tid, max 32 mg/day

**Child 6-13 yr:** PO- EXT REL 4 mg q12h, max 24 mg/day; PO 2 mg tid-qid, max 24 mg/day

**Child 2-5 yr:** PO 0.1 mg/kg tid, max 23 mg/day

**Adult/child ≥ 15 yr:** PO- Syrup 2-4 mg (1-2 tsp) tid-qid, max 32 mg/day

**Child 6-14 yr:** PO-Syrup 2 mg (1 tsp) tid-qid, max 24 mg /day

**Child 2-5 yr:** PO-Syrup 0.1 mg/kg tid, max 12 mg/day

### To prevent exercise-induced bronchospasm (not ProAir RespiClick)

**Adult/child ≥ 4 yr:** INH 2 inhalations before exercise, max 12 INH/24 hr; ProAir RespiClick INH 2 inhalations 15-30 min before exercise

### Other respiratory conditions

**Adult and child ≥12 yr:** INH (metered dose inhaler) 1 puff q4-6hr; PO 2-4 mg tid-qid, max 32 mg/day, depending on formulation; NEB/IPPB 2.5 mg tid-qid

**Geriatric:** PO 2 mg tid-qid, may increase gradually to 8 mg tid-qid

**Child 2-12 yr:** INH (metered dose inhaler) 0.1 mg/kg tid (max 2.5 mg tid-qid); NEB/IPPB 0.1-0.15 mg/kg/dose tid-qid or 1.25 mg tid-qid for child 10-15 kg or 2.5 mg tid-qid >15 kg

**Available forms:** INH aerosol 108 mcg/actuation; tabs 2, 4 mg; oral syr 2 mg/5 ml; ext rel 4, 8 mg; inh sol 0.083, 0.5, 0.042%, 0.02%; powder inhaler 90 mcg/actuation

### Implementation

**PO route**

- Do not break, crush, or chew ext rel tabs
- Give PO with meals to decrease gastric irritation; oral sol for children (no alcohol, sugar)
- In geriatric patients, a spacing device is advised

**Aerosol route**

- Give after shaking metered dose inhaler; have patient exhale and place mouthpiece in mouth, inhale slowly while depressing inhaler, hold breath, remove inhaler, exhale slowly; allow at least 1 min between inhalations; avoid using near flames or source of heat
- Track number of inhalations used and discard when labeled inhalations have been used
- Store in light-resistant container; do not expose to temperatures >86° F (30° C)

### Albuterol Administration

- ProAir RespiClick: Before using for the first time, check the dose counter window that the number 200 is in the window. The dose counter only displays even numbers; hold the inhaler upright while opening the cap fully; when the cap is opened, a dose will be activated for delivery; make sure a "click" is heard; do not open the cap unless ready to give dose; the patient should breathe out through the mouth be careful that the patient does not breathe out into the inhaler mouthpiece; put the mouthpiece in the mouth and have patient close lips around it; the patient should breathe in deeply through the mouth; ensure that the vent above the mouthpiece is not blocked by the patient's lips or fingers; hold breath for about 10 sec; remove the inhaler; check dose counter on the back of the inhaler to make sure the dose was received; close the cap over the mouthpiece after each use of the inhaler; make sure the cap closes firmly into place; to inhale another dose, close the cap and then repeat inhaler steps; do not wash or put any part of the inhaler in water; if the mouthpiece needs cleaning, gently wipe with a dry cloth or tissue; when there are 20 doses left, the counter will change to red; refill

**Nebulizer/IPPB route**

- **Dilute** 5 mg/ml sol/2.5 ml 0.9% NaCl for inhalation; other solutions do not require dilution for nebulizer $O_2$ flow or compressed air 6-10 L/min

## ADVERSE EFFECTS

**CNS:** *Tremors, anxiety,* insomnia, headache, dizziness, stimulation, *restlessness,* hallucinations, flushing, irritability
**CV:** *Palpitations, tachycardia, hypertension,* angina, hypotension, dysrhythmias
**EENT:** Dry nose, irritation of nose and throat
**GI:** *Heartburn, nausea, vomiting*
**MISC:** Flushing, sweating, anorexia, bad taste/smell changes, hypokalemia
**MS:** Muscle cramps
**RESP:** Cough, wheezing, dyspnea, paradoxical bronchospasm, dry throat

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO) |
| **Distribution** | Unknown |
| **Metabolism** | Liver extensively, tissues |
| **Excretion** | Unknown, breast milk |
| **Half-life** | 3-4 hr |

### Pharmacodynamics

| | PO | PO–ext rel | INH |
|---|---|---|---|
| **Onset** | ½ hr | ½ hr | 5-15 min |
| **Peak** | 2½ hr | 2-3 hr | 1½-2hr |
| **Duration** | 2 hr | 12 hr | 4-6 hr |

## INTERACTIONS

### Individual drugs

Arsenic trioxide, chlorproMAZINE, droperidol, melfloquine, mesoridazine, tacrolimus: Increased: QTc prolongation, monitor QTc carefully
Atomoxetine, selegiline: increased CV effects
Digoxin: increased digoxin level

### Drug classifications

Adrenergics: increased action of albuterol; do not use together
β-Adrenergic blockers: block therapeutic effect
Bronchodilators (aerosol): increased action of bronchodilator
Class III/IV antidysrhythmics (amiodarone, disopyramide, dofetilide, procainamide, quiNIDine, sotalol); Increased: QTc prolongation; monitor QT carefully
CNS stimulants: increased CNS stimulation
Diuretics (potassium-losing): increased ECG changes/hypokalemia
MAOIs, tricyclics: increased chance of hypertensive crisis; do not use together
Oxytocics: severe hypotension; do not use together
Theophylline: toxicity

### Drug/herb

Black tea, green tea, kola nut, guarana, yerba maté: increased stimulation

### Drug/food

Caffeine products, chocolate: increased stimulation

### Drug/lab test

Decreased: potassium

## NURSING CONSIDERATIONS

### Assessment

- Assess respiratory function: vital capacity, forced expiratory volume, ABGs, lung sounds; heart rate, rhythm; B/P, sputum (baseline and during therapy)
- Determine that patient has not received theophylline therapy before giving dose, to prevent additive effect; client's ability to self-medicate
- Monitor for evidence of allergic reactions; paradoxic bronchospasm; withhold dose; notify prescriber if bronchospasm occurs
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, use only if benefits outweigh fetal risk; avoid use in breastfeeding

### Patient/family education

- Tell patient not to use OTC medications before consulting prescriber; excess stimulation may occur; instruct patient to use this medication before other medications and allow at least 5 min between each to prevent overstimulation; to limit caffeine products such as chocolate, coffee, tea, and cola
- Teach patient to use inhaler; review package insert with patient; to avoid getting aerosol in eyes or blurring may result; to wash inhaler in warm water and dry daily; to rinse mouth after using; to avoid smoking, smoke-filled rooms, persons with respiratory infections, about when to empty and when to renew
- Teach patient that if paradoxic bronchospasm occurs to stop product immediately and notify prescriber
- Instruct patient on administration of dose, not to use more than prescribed; serious side effects may occur; if taking PO regularly and dose is missed, take when remembered; space other doses on new time schedule; do not double doses
- In geriatric patients, a spacing device is advised
- **Pregnancy/breastfeeding:** teach patient to notify provider if pregnancy is planned or suspected, or if breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Absence of dyspnea and wheezing after 1 hr
- Improved airway exchange
- Improved ABGs

## TREATMENT OF OVERDOSE:
Administer a $\beta_1$-adrenergic blocker, **IV** fluids

**⚠ HIGH ALERT**

**RARELY USED**

### alemtuzumab
(al′em-tooz′ue-mab)
**Lemtrada**
*Func. class.:* Biologic response modifier

**USES:** Reserved for those with multiple sclerosis with inadequate response to ≥2 drugs because of severe adverse reactions

## CONTRAINDICATIONS: HIV

## DOSAGE AND ROUTES
**Adult: IV** 12 mg/day for 5 consecutive days (total 60 mg) for a first treatment course; follow 12 mo later with 12 mg/day for 3 consecutive days (total 36 mg) for a second treatment course

### alendronate (Rx)
(al-en′droe-nate)
**Binosto, Fosamax, Fosamax plus D**
*Func. class.:* Bone-resorption inhibitor
*Chem. class.:* Bisphosphonate

**Do not confuse:** Fosamax/Flomax

**ACTION:** Decreases rate of bone resorption and may directly block dissolution of hydroxyapatite crystals of bone; inhibits osteoclast activity

**Therapeutic outcome:** Decreased symptoms of osteoporosis, Paget's disease

**USES:** Treatment and prevention of osteoporosis in postmenopausal women, treatment of osteoporosis in men, Paget's disease, treatment of corticosteroid-induced osteoporosis in postmenopausal women not receiving estrogen, or in men who are continuing corticosteroid treatment with low bone mass

## CONTRAINDICATIONS
Hypersensitivity to bisphosphonates, delayed esophageal emptying, inability to sit or stand for 30 min, hypocalcemia

**Precautions:** Pregnancy, breastfeeding, children, CCr <35 ml/min, esophageal disease, increased esophageal cancer risk, ulcers, gastritis, poor dental health

## DOSAGE AND ROUTES
### Osteoporosis in postmenopausal women
**Adult and geriatric:** PO 10 mg daily or 70 mg qwk

### Paget's disease
**Adult and geriatric:** PO 40 mg daily × 6 mo, consider retreatment for relapse

### Prevention of osteoporosis in postmenopausal women (excluding Binosto and oral solution)
**Adult (postmenopausal females):** PO 5 mg daily or 35 mg qwk

### Glucocorticoid-induced osteoporosis in those receiving glucocorticoids (daily dose >7.5 mg or predniSONE) and low bone density (excluding Binosto and oral solution)
**Adult:** PO 5 mg qday, those not receiving estrogen 10 mg qday

### Renal dose
**Adult:** PO CCr ≤35 ml/min, not recommended

**Available forms:** Tabs 5, 10, 35, 40, 70 mg, tabs 70 mg with 2800 IU Vit $D_3$, 70 mg with 5600 IU Vit $D_3$; oral sol 70 mg/75 ml, effervescent tab 70 mg

### Implementation
- Give PO for 6 mo to be effective in Paget's disease; take with 8 oz of water 30 min before 1st food, beverage, or medication of the day
- Patient to remain upright for 30 min after dose to prevent esophageal irritation
- Store in cool environment out of direct sunlight

**Tablet:**
- Do not lie down for ≥30 min after dose, do not take at bedtime

**Liquid:**
- Use oral syringe or calibrated device; give in AM with ≥2 oz of water ≥30 min before food, beverage, or medication

## ADVERSE EFFECTS
**CNS:** Headache
**GI:** Abdominal pain, constipation, nausea, vomiting, esophageal ulceration, acid reflux, dyspepsia, esophageal perforation, diarrhea, esophageal cancer
**META:** Hypophosphatemia, hypocalcemia
**MS:** Bone pain, osteonecrosis of the jaw, bone fractures
**SYST:** Angioedema, Stevens-Johnson syndrome, toxic epidermal necrolysis

### Pharmacokinetics

| | |
|---|---|
| **Distribution** | Mainly to bones; protein binding 78% |
| **Metabolism** | Unknown |
| **Excretion** | Via kidneys after bound to bone |
| **Half-life** | >10 yrs |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Drug classifications

Antacids, calcium supplements: decreased absorption give alendronate at least 30-60 min before other products

$H_2$ blockers, proton pump inhibitors (PPIs), gastric mucosal agents, NSAIDs, salicylates: adverse GI reactions, monitor for GI reactions

### Drug/food

Caffeine, food, orange juice: decreased product absorption, take food at least 30 min after this product

### Drug/lab test

Decreased: calcium, phosphate

## NURSING CONSIDERATIONS

### Assessment

- **Assess for serious reactions:** angioedema, Stevens-Johnson syndrome, toxic epidermal necrolysis, atrial fibrillation
- Assess dental status, regular dental exams should be done; dental extractions (cover with antiinfectives) prior to procedure
- Hormonal status if a woman, prior to treatment
- Assess for **osteoporosis:** bone density testing baseline and during treatment, history of fractures
- For **Paget's disease:** increased skull size, bone pain, headache
- Monitor renal studies and electrolytes (calcium, potassium, magnesium, phosphorous) BUN/creatinine
- Assess for **hypercalcemia:** paresthesia, twitching, laryngospasm, Chvostek's, Trousseau's signs, correct before use
- Monitor alkaline phosphatase; level of 2 × upper limit of normal is indicated for Paget's disease
- **Pregnancy/breastfeeding:** Use in pregnancy only if benefits outweigh fetal risk, use cautiously in breastfeeding
- MS or bone pain: may occur in a few days after start of treatment to years later, usually pain resolves after stopping treatment

### Patient/family education

- Teach patient to remain upright for 30 min after dose to prevent esophageal irritation; if dose is missed, skip dose, do not double doses or take later in day
- Teach patient to take in AM, only before food, other meds, to take with 6-8 oz of water (not mineral water)
- Teach patient to take calcium, vit D if instructed by provider
- Teach patient to use weight-bearing exercise to increase bone density
- Teach patient to let provider know if pregnancy is planned or suspected or if nursing
- Advise to maintain good oral hygiene

### Evaluation

**Positive therapeutic outcome**

- Increased bone mass, absence of fractures

## alfuzosin (Rx)

(al-fyoo'zoe-sin)

**Uroxatral, Xatral**

*Func. class.:* Urinary tract, antispasmodic, $\alpha_1$-agonist

*Chem. class.:* Quinazolone

**ACTION:** Binds preferentially to $\alpha_{1A}$-adrenoceptor subtype located mainly in the prostate, relaxing smooth muscles

**Therapeutic outcome:** Resolution of symptoms of benign prostatic hyperplasia

**USES:** Symptoms of benign prostatic hyperplasia

## CONTRAINDICATIONS

Hypersensitivity, moderate to severe hepatic impairment, not indicated for use in women or children, breastfeeding (but not used in women)

**Precautions:** Pregnancy, geriatric, coronary artery disease, coronary insufficiency, mild hepatic disease, mild/moderate/severe renal disease, history of QT prolongation or coadministration with medications known to prolong QT interval, torsades de pointes, syncope, surgery, prostate cancer, orthostatic hypotension, ocular surgery, CAD, dysrhythmias, angina

## DOSAGE AND ROUTES

**Adult:** PO EXT REL 10 mg daily, taken after same meal each day

**Available forms:** EXT REL tabs 10 mg

### Implementation

- Swallow tabs whole; do not break, crush, or chew tabs
- Store in tight container in cool environment

## ADVERSE EFFECTS

**CNS:** *Dizziness, headache,* fatigue, flushing

**CV:** Postural hypotension (dizziness, light-headedness, fainting) within a few hours of administration, chest pain, tachycardia, angina

**GI:** Nausea, abdominal pain, dyspepsia, constipation, diarrhea, liver injury, jaundice

**GU:** Impotence, priapism

**HEMA:** Thrombocytopenia

**INTEG:** Rash, urticaria, angioedema, pruritus, toxic epidermal necrolysis
**MISC:** Body pain in general, xerostomia, rhinitis
**RESP:** Upper respiratory tract infection, pharyngitis, bronchitis, sinusitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Moderately protein bound (82%-90%) |
| **Metabolism** | Liver (by CYP3A4 enzyme) |
| **Excretion** | Urine |
| **Half-life** | 10 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Alcohol: possible increased effects of alfuzosin
Doxazosin, itraconazole, ketoconazole, prazosin, ritonavir, terazosin: do not take concurrently

### Drug classifications

b-Blockers, nitrates, antihypertensives, phosphodiesterase 5 inhibitors: increased hypotension
Class IA/III antidysrythmics: QT prolongation (slight)
CYP3A4 inhibitors, cimetidine (ketoconazole, itraconazole, ritonavir): do not take concurrently, toxic epidermal necrolysis

## NURSING CONSIDERATIONS

### Assessment

- Assess for prostatic hyperplasia: change in urinary patterns, baseline and throughout treatment
- Monitor CBC with differential and liver function tests; B/P and heart rate; QT prolongation
- Monitor BUN, uric acid, urodynamic studies (urinary flow rates, residual volume)
- Monitor I&O ratios, weight daily, edema; report weight gain or edema
- **Serious skin reactions:** Assess for angioedema, toxic epidermal necrolysis, notify prescriber immediately, stop product

### Patient/family education

- Advise not to drive or operate machinery for 4 hr after first dose or after dosage increase, meds, herbs
- Teach patient to take at the same time of the day with food; do not double doses
- Advise patient about orthostatic hypotension, to rise slowly from sitting or lying

### Evaluation

**Positive therapeutic outcome**

- Decreased symptoms of benign prostatic hyperplasia

# alirocumab (Rx)

(al′-i- rok′-ue-mab)
**Praluent**
*Func. class.:* Antilipemic

**ACTION:** Binds to low-density lipoproteins, a human monoclonal antibody (IgG1)

**Therapeutic outcome:** Decreased cholesterol levels

**USES:** Heterozygous, familial hypercholesterolemia, atherosclerotic disease

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding

## DOSAGE AND ROUTES

**Adult: SUBCUT** 75 mg q2wk, may increase to 150 mg q2wk if needed

**Available forms:** Prefilled pen 75 mg/1 ml, 150 mg/1 ml

### Implementation

- If dose is missed give within 7 days of next dose; if over 7 days, wait until next scheduled dose
- Visually inspect for particulate matter and discoloration, solution is clear, colorless to pale yellow
- Warm to room temperature for 30-40 min before use. Use as soon as possible after warming
- Do NOT use the pre-filled pen or syringe if it has been at room temperature for ≥24 hr
- Give by SUBCUT inj into the thigh, abdomen, or upper arm. Rotate inj site with each inj.
- Do NOT inject into areas of active skin disease or injury (sunburn, rash, inflammation, skin infection)
- Do NOT administer with other injectable drugs at the same inj site

## ADVERSE EFFECTS

**CNS:** Memory impairment, confusion
**GI:** Diarrhea
**INTEG:** Pruritus, injection-site reaction, erythema, ecchymosis
**MISC:** Edema
**MS:** Myalgia
**RESP:** Pharyngitis, sinusitis, cough
**SYST:** Infection, antibody formation

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | At steady state 17-20 days |

### Pharmacodynamics

| | |
|---|---|
| **Peak** | 3-7 days |

## INTERACTIONS

None known

### Drug/lab test

Increased: LFTs

## NURSING CONSIDERATIONS

### Assessment

- **Hypercholesterolemia:** Obtain diet history: fat content, lipid levels (triglycerides, LDL, LDL-C 4-8 wk after start of titration, HDL, cholesterol); LFTs at baseline, periodically during treatment

### Patient/family education

- Teach patient that compliance is needed
- Advise that risk factors should be decreased: high-fat diet, smoking, alcohol consumption, absence of exercise
- Advise patient to notify prescriber if pregnancy suspected, planned, or if breastfeeding
- Inform patient to report confusion, injection-site reactions

### Evaluation

- Therapeutic response: decreased cholesterol, LDL; increased HDL

## aliskiren (Rx)

(a-lis'kir-en)

**Tekturna, Rasilez**

*Func. class.:* Antihypertensive

*Chem. class.:* Direct renin inhibitor

**ACTION:** Renin inhibitor that acts on the renin-angiotensin system (RAS)

**Therapeutic outcome:** Decrease in B/P

**USES:** Hypertension, alone or in combination with other antihypertensives

## CONTRAINDICATIONS

Hypersensitivity

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Breastfeeding, children, geriatric, angioedema, aortic/renal artery stenosis, cirrhosis, CAD, dialysis, hyper/hypokalemia, hyponatremia, hypotension, hypovolemia, renal/hepatic disease, surgery, diabetes

## DOSAGE AND ROUTES

**Adult:** PO 150 mg/day, may increase to 300 mg/day if needed, max 300 mg/day

**Available forms:** Tabs 150, 300 mg

### Implementation

- May use with other antihypertensives
- PO; do not use with a high-fat meal
- Give daily with a full glass of water, titrate up to achieve correct dose
- Do not discontinue abruptly; correct electrolyte/volume depletion prior to treatment
- Store in tight container at room temperature

## ADVERSE EFFECTS

**CNS:** Headache, dizziness, seizures
**CV:** Orthostatic hypotension, hypotension
**GI:** *Diarrhea*
**GU:** Renal stones, increased uric acid
**INTEG:** Rash
**META:** Hyperkalemia
**MISC:** Angioedema, cough

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Poor, bioavailability 2.5% |
| **Distribution** | Steady state 7-8 days |
| **Metabolism** | Unknown |
| **Excretion** | 91% unchanged in the feces |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-3 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Atorvastatin, cycloSPORINE, itraconazole, ketoconazole: increased aliskiren levels, concurrent use is not recommended
Warfarin: decreased levels of warfarin

### Drug classifications

Do not use with ACE inhibitors, angiotensin II receptor antagonists, potassium-sparing diuretics, potassium supplements: increased potassium levels
Diuretics, other antihypertensives: increased hypotension
Do not use ACE inhibitors, angiotensin II receptor antagonists in diabetes mellitus

### Drug/food

High-fat meal: aliskiren effect, grapefruit

### Drug/lab test

Increased: uric acid, BUN, serum creatinine, potassium

## NURSING CONSIDERATIONS

### Assessment

- Monitor renal tests: uric acid, serum creatinine, BUN may be increased; hyperkalemia may occur, correct salt depletion, hyperkalemia, volume depletion before starting this product
- **Assess for allergic reactions:** angioedema may occur
- Monitor daily dependent edema in feet, legs; weight, B/P, orthostatic hypotension
- **Diabetes:** Identify the use of ACE inhibitors, angiotensin II receptor antagonists, do not use with aliskiren

### Patient/family education

**BLACK BOX WARNING:** Teach patient to notify prescriber if pregnancy is planned or suspected; if pregnant, product will need to be discontinued

- Teach patient the importance of complying with dosage schedule even if feeling better
- Teach patient how to take B/P and normal reading for age-group
- Advise patient that if dose is missed, take as soon as possible; if it is almost time for the next dose, take only that dose; do not double dose, do not take with a high-fat meal or grapefruit
- Instruct patient not to use OTC products, including herbs, supplements unless approved by prescriber
- **Advise patient to report to prescriber immediately:** dizziness, faintness, chest pain, palpitations, uneven or rapid heart beat, headache, severe diarrhea, swelling of tongue or lips, trouble breathing, difficulty swallowing, tightening of the throat
- Caution patient not to operate machinery or perform hazardous tasks if dizziness occurs
- Advise patient to rise slowly in order to avoid faintness

### Evaluation

**Positive therapeutic outcome**

- Decrease in B/P

## allopurinol (Rx)

(al-oh-pure'i-nole)

**Alloprin, Purinol 1, Aloprim, Zyloprim**

*Func. class.:* Antigout drug, antihyperuricemic

*Chem. class.:* Xanthine enzyme inhibitor

**Do not confuse:** Zyloprim/Zovirax/ZORprin/zolpidem

**ACTION:** Inhibits the enzyme xanthine oxidase, reducing uric acid synthesis

**Therapeutic outcome:** Decreasing serum uric acid levels, decreasing joint pain

**USES:** Chronic gout, hyperuricemia associated with malignancies, recurrent calcium oxalate calculi, uric acid calculi

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, renal/hepatic disease

## DOSAGE AND ROUTES

### Increased uric acid levels in malignancies

**Adult:** PO 600-800 mg/day in divided doses, for 2-3 days; start up to 1-2 days prior to chemotherapy; **IV** INF 200-400 mg/m$^2$/day, max 600 mg/day 24-48 hr prior to chemotherapy, may be divided at 6-, 8-, 12-hr intervals

**Child 6-10 yr:** PO 300 mg/day, adjust dose after 48 hr

**Child <6 yr:** PO 150 mg/day, adjust dose after 48 hr

**Child:** **IV** INF 200 mg/m$^2$/day, initially as a single dose or divided q6-12hr

### Gout (mild)

**Adult:** PO 200-300 mg/day, increase qwk based on uric acid levels, max 800 mg/day

### Gout (moderate-severe)

**Adult:** PO 400-600 mg/day in a single dose or divided bid-tid, max 800 mg/day, doses >300 mg should be given in divided doses, may start during an acute attack as long as antiinflammatories are being used

### Recurrent calculi

**Adult:** PO 200-300 mg/day in a single dose or divided bid-tid

### Uric acid nephropathy prevention

**Adult and child >10 yr:** PO 600-800 mg daily × 2-3 days

### Renal dose

**Adult:** PO/IV CCr 81-100 ml/min 300 mg/day; CCr 61-80 ml/min 250 mg/day; CCr 41-60 ml/min 200 mg/day; CCr 21-40 ml/min 150 mg/day; CCr 10-20 ml/min 100-200 mg/day; CCr 3-9 ml/min 100 mg/day or 100 mg every other day; CCr <3 ml/min 100 mg q24hr or longer or 100 mg every third day

**Available forms:** Tabs, scored, 100, 300 mg; powder for inj 500 mg/vial

## Implementation

### PO route

- Give with meals to prevent GI symptoms; crush and mix with food or fluids for patients with swallowing difficulties
- Increase fluid intake to 2 L/day
- Begin 1-2 days before antineoplastic therapy if using for hyperuricemia associated with malignancy

### Intermittent IV infusion route

- Use in tumor lysis before starting chemotherapy (24-48 hr)
- Reconstitute 30-ml vial with 25 ml of sterile water for inj; dilute to desired conc (≤6 mg/ml) with 0.9% NaCl for inj or $D_5$ for inj, begin inf within 10 hr

**IV compatibilities:** Acyclovir, aminophylline, amphotericin B lipid complex, anidulafungin, argatroban, atenolol, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium gluconate, CARBOplatin, caspofungin, ceFAZolin, cefoTEtan, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, CISplatin, cyclophosphamide, DACTINomycin, DAUNOrubicin liposome, dexamethasone, dexmedetomidine, DOCEtaxel, DOXOrubicin liposomal, enalaprilat, etoposide, famotidine, fenoldopam, filgrastim, fluconazole, fludarabine, fluorouracil, furosemide, gallium, ganciclovir, gatifloxacin, gemcitabine, gemtuzumab, granisetron, heparin, hydrocortisone phosphate, hydrocortisone succinate, HYDROmorphone, ifosfamide, linezolid, LORazepam, mannitol, mesna, methotrexate, metroNIDAZOLE, milrinone, mitoXANtrone, morphine, nesiritide, octreotide, oxytocin, PACLitaxel, pamidronate, pantoprazole, PEMEtrexed, piperacillin, piperacillin-tazobactam, plicamycin, potassium chloride, ranitidine, sodium, sulfamethoxazole-trimethoprim, teniposide, thiotepa, ticarcillin, ticarcillin clavulanate, tigecycline, tirofiban, vancomycin, vasopressin, vinBLAStine, vinCRIStine, voriconazole, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**GI:** *Nausea, vomiting, malaise,* cramps, diarrhea
**INTEG:** rash
**MS:** Acute gouty attack

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 80% |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver to oxypurinol |
| **Excretion** | Kidneys |
| **Half-life** | 1-2 hr |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | Unknown | Unknown |
| **Peak** | 1½ hr | Up to 30 min |
| **Duration** | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Ammonium chloride, potassium/sodium phosphate, vit C: increased kidney stone formation
Ampicillin, amoxicillin: increased risk of rash, avoid concurrent use
AzaTHIOprine: increased bone marrow depression
Mercaptopurine: increased bone marrow depression
Rasburicase: increased xanthine nephropathy, calculi
Theophylline: increased action of theophylline

### Drug classifications

ACE inhibitors: increased hypersensitivity, toxicity
Anticoagulants (oral): increased action of oral anticoagulants
Antidiabetics (oral): increased action of antidiabetics
Antineoplastics: increased bone marrow suppression
Diuretics (thiazide): increased hypersensitivity

## NURSING CONSIDERATIONS

### Assessment

- Assess for **pain** including location, characteristics, onset/duration, frequency, quality, intensity or severity of pain, precipitating factors; **gout:** joint pain, swelling, may use with NSAIDs for acute gouty attacks
- Monitor uric acid levels q2wk; normal uric acid levels are 6 mg/dl or less; effect may take several wk; check I&O ratio, increase fluids to 2 L/day to prevent stone formation, toxicity
- Monitor CBC, AST, BUN, creatinine before starting treatment, monthly; check blood glucose in diabetic patients receiving oral antidiabetic agents
- Assess for rash, hypersensitivity reactions, if present discontinue this product immediately
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excretion unknown

### Patient/family education

- Tell patient to increase fluid intake to 2 L/day; to avoid taking large doses of vit C; kidney stone formation may occur; to maintain a diet enhancing urine alkalinity (e.g., milk, other dairy products); if taking for calcium oxalate stones, reduce dairy products, refined sugar, sodium, meat

• Tell patient to report skin rash, stomatitis, malaise, fever, aching; product should be discontinued
• Advise patient to avoid hazardous activities if drowsiness or dizziness occurs; response may take several days to determine
• Tell patient to avoid alcohol, caffeine; these substances increase uric acid levels and decrease allopurinol levels
• Teach patient to report side effects and adverse reactions to prescriber, including rash, itching, nausea, vomiting

### Evaluation

**Positive therapeutic outcome**
• Decreased pain in joints
• Decreased stone formation in kidney
• Decreased uric acid level to 6 mg/dl

## almotriptan (Rx)

(al-moh-trip'tan)
**Axert**
*Func. class.:* Antimigraine agent
*Chem. class.:* 5-$HT_1$ receptor agonist, triptan

**Do not confuse:** Axert/Antivert

**ACTION:** Binds selectively to the vascular 5-$HT_{1B/1D/1F}$ receptor subtype, exerts antimigraine effect; causes vasoconstriction in cranial arteries

**Therapeutic outcome:** Absence of migraines

**USES:** Acute treatment of migraine with or without aura (Adults/adolescents/children ≥12 yr)

## CONTRAINDICATIONS

Hypersensitivity, acute MI, angina, CV disease, CAD, stroke, vasospastic angina, ischemic heart disease or risk for, peripheral vascular syndrome; uncontrolled hypertension, basilar or hemiplegic migraine

**Precautions:** Pregnancy, breastfeeding, children <18 yr, geriatric, postmenopausal women, men >40 yr, risk factors for coronary artery disease, MI, hypercholesterolemia, obesity, diabetes, impaired renal/hepatic function, sulfonamide hypersensitivity, cardiac dysrhythmias, Raynaud's disease, tobacco smoking, Wolff-Parkinson-White syndrome

## DOSAGE AND ROUTES

**Adult/adolescent/child ≥12 yr:** PO 6.25-12.5 mg, may repeat dose after 2 hr; max 2 doses/24 hr, 25 mg/day, or 4 treatment cycles within any 30-day period

**Renal/hepatic dose (CCr 10-30 ml/hr)**
**Adult:** PO 6.25 mg initially, max 12.5 mg

**Available forms:** Tabs 6.25 or 12.5 mg

### Implementation

• Swallow tabs whole; do not break, crush, or chew tabs, without regard to food 2 times/24 hr
• Provide quiet, calm environment with decreased stimulation from noise, bright light, excessive talking

## ADVERSE EFFECTS

**CNS:** *Dizziness,* headache, seizures, paresthesias
**CV:** *Flushing,* palpitations, tachycardia, coronary artery vasospasm, MI, ventricular fibrillation, ventricular tachycardia
**EENT:** Throat, mouth, nasal discomfort; vision changes
**GI:** Nausea, xerostomia
**INTEG:** Sweating, rash
**MS:** *Weakness, neck stiffness,* myalgia
**RESP:** Chest tightness, pressure

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (~70%) |
| **Distribution** | 35% protein bound |
| **Metabolism** | Liver (metabolite); metabolized by MAO-A, CYP2D6, CYP3A4 |
| **Excretion** | Urine 40%, feces 13% |
| **Half-life** | 3-4 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-3 hr |
| **Duration** | 3-4 hr |

## INTERACTIONS

### Individual drugs

Ergot: increased vasospastic effects, avoid concurrent use
Erythromycin, itraconazole, ketoconazole, ritonavir: increased plasma concentration of almotriptan, avoid concurrent use in renal/hepatic disease

### Drug classifications

5-$HT_1$ agonists, ergot derivatives: increased vasospastic effects, avoid concurrent use
CYP2D6 inhibitors: increased almotriptan effect; do not use together
MAOIs: increased almotriptan effect; do not use together
SSRIs, SNRIs, serotonin-receptor agonists, sibutramine: increased serotonin syndrome

### Drug/herb
Feverfew: avoid use
St. John's wort: increased serotonin syndrome

## NURSING CONSIDERATIONS
### Assessment
- Assess for **migraine:** pain, location, aura, duration, intensity, nausea, vomiting
- Assess B/P, signs/symptoms of coronary vasospasms
- Assess for tingling, hot sensation, burning, feeling of pressure, numbness, flushing
- Assess for stress level, activity, recreation, coping mechanisms
- Assess neurologic status: LOC, blurring vision, nausea, vomiting, tingling in extremities preceding headache
- Assess for ingestion of **tyramine-containing foods** (pickled products, beer, wine, aged cheese), food additives, preservatives, colorings, artificial sweeteners, chocolate, caffeine, which may precipitate these types of headaches
- **Assess for serotonin syndrome:** occurs in those taking SSRIs, SNRIs; agitation, confusion, hallucinations, diaphoresis, hypertension, diarrhea, fever, tremor, usually occurs when dose is increased
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, use only if benefits outweigh fetal risk, use cautiously in breastfeeding

### Patient/family education
- Instruct patient to use contraception while taking product, notify prescriber if pregnancy is planned or suspected, avoid breastfeeding
- Advise patient to have dark, quiet environment available
- Inform patient that product does not prevent or reduce number of migraine attacks, max 4 doses/30 days, do not take MAOIs for ≥ 24 hr
- Advise patient to report chest pain, drowsiness, dizziness, tingling, flushing

### Evaluation
**Positive therapeutic outcome**
- Decrease in severity of migraine

## TREATMENT OF OVERDOSE:
Gastric lavage; clinical and ECG monitoring for ≥20 hr after overdose

**⚠ HIGH ALERT**

# alogliptin
(al'oh glip'tin)
**Nesina**
*Func. class.:* Antidiabetic
*Chem. class.:* Dipeptidyl peptidase-4 (DPP-4) inhibitor

**ACTION:** A dipeptidyl peptidase-4 (DPP-4) inhibitor for the treatment of type 2 diabetes mellitus (monotherapy or in combination with other antidiabetic agents), potentiates the effects of the incretin hormones by inhibiting their breakdown by DPP-4

**Therapeutic outcome:** Decrease in polyuria, polydipsia, polyphagia; clear sensorium, absence of dizziness; improvement in A1c, daily blood glucose monitoring

**USES:** Type 2 diabetes mellitus (T2DM)

## CONTRAINDICATIONS
Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, hepatic disease, burns, ketoacidosis, diarrhea, fever, GI obstruction, hyper/hypoglycemia, hyper/hypothyroidism, type 1 diabetes, hypercortisolism, children, ileus, malnutrition, pancreatitis, surgery, trauma, vomiting, kidney disease, adrenal insufficiency, angioedema

## DOSAGE AND ROUTES
**Adult: PO** 25 mg/day; when used in combination, a lower dose of the other antidiabetic may be needed

### Renal dose
**Adult:** PO CCr 30-59 ml/min: 12.5 mg/day; CCr 30 ml/min: 6.25 mg/day; intermittent hemodialysis: 6.25 mg/day; give without regard to the timing of hemodialysis

**Available forms:** Tab 6.25, 12.5, 25

### Implementation
Give without regard to food

## ADVERSE EFFECTS
**CNS:** Headache
**GI:** Pancreatitis
**META:** Hypoglycemia
**RESP:** Upper respiratory infection, nasopharyngitis
SYST: Rash, hypersensitivity, angioedema, Stevens–Johnson syndrome, anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unchanged (urine) |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-2 hr |
| **Duration** | Effect decreased (liver disease), increased (kidney disease), half-life 21 hr |

## INTERACTIONS

**Increase:** Hypoglycemia-insulin, sulfonylureas, androgens; dose adjustment may be needed
**Thiazides:** decrease; hypoglycemia, adjust dose if needed

### Drug/lab test

Increased: LFTs
Decrease: Glucose

## NURSING CONSIDERATIONS

### Assessment

- Diabetes: monitor blood glucose, glycosylated hemoglobin (A1c), LFTs, serum creatinine/BUN baseline and throughout treatment
- **Assess for pancreatitis:** can occur anytime during use, severe abdominal pain with or without vomiting
- **Monitor for hypersensitivity reactions:** angioedema
- Assess for Stevens-Johnson syndrome
- **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding

### Patient/family education

- Inform patient that diabetes is a life-long condition; product does not cure disease
- Advise patient to consume all food on diet plan, to continue other medical and lifestyle regimens
- Teach patient to carry emergency ID with prescriber, medications, and condition listed
- Teach patient to test blood glucose using a blood glucose meter
- Teach patient to test blood glucose using a blood glucose meter
- Advise patient to report allergic reactions, nausea, vomiting, abdominal pain, dark urine

### Evaluation

**Positive therapeutic outcome**

- Decrease in polyuria, polydipsia, polyphagia, clear sensorium, absence of dizziness, improvement in A1c, daily blood glucose monitoring

# alosetron

(ah-loss'a-tron)
**Lotronex**
*Func. class.:* Anti-IBS agent; serotonin receptor antagonist 5-HT3

**Do not confuse:** Lotronex/Lovenox/Protonix

**ACTION:** A potent and selective antagonist at serotonin 5-HT3 receptors; 5-HT3 receptors are extensively distributed on enteric neurons in the GI tract; antagonism at these receptors in the GI tract modulate the regulation of visceral pain, colonic transit, and GI secretions

**Therapeutic outcome:** Decreased irritable bowel syndrome (IBS) symptoms

**USES:** Severe-diarrhea-predominant IBS

## CONTRAINDICATIONS

Crohn's disease, severe hepatic disease, toxic megacolon, GI adhesions/strictures/obstruction, thrombophlebitis, ulcerative colitis

**BLACK BOX WARNING:** Ischemic colitis, severe constipation

**Precautions:** Pregnancy, breastfeeding, child <18 yr, mild to moderate hepatic disease

## DOSAGE AND ROUTES

**Adult (woman): PO** 0.5 mg bid, may increase to 1 mg bid after 4 wk if well tolerated; discontinue if symptoms are not controlled after 4 wk

**Available forms:** Tab 0.5 mg

### Implementation

- Give without regard to meals with full glass of water
- Store at room temperature, protect from light and moisture

**BLACK BOX WARNING:** Use only after Physician- "Patient Acknowledgement Form" is signed and patient receives official medication guide

## ADVERSE EFFECTS

**GI:** Constipation, abdominal pain, distention, reflux, nausea, obstruction, impaction, ischemic colitis, ileus perforation, small-bowel mesenteric ischemia
**CNS:** Fatigue, headache
**GU:** Urinary tract infection
**MS:** Muscle spasm
**RESP:** Cough, nasopharyngitis, upper respiratory tract infection

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Extensively in the liver |
| **Excretion** | Unknown, mainly excreted in urine |
| **Half-life** | 1½ hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Tricyclic antidepressants, H1-blockers: increased serious reactions

CYP3A4, CYP1A2, CYP2C9 inhibitors, hydrALAZINE, procainamide: decreased alosetron metabolism

CYP3A4 inducers: increased alosetron metabolism

### Individual drugs

Orphenadrine, OLANZapine, maprotiline, disopyramide, cyclobenzaprine, cloZAPine, buPROPion, amoxapine, amantadine: increased serious reactions

### Drug/lab test

Increased: ALT

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Irritable bowel syndrome: Assess for constipation, diarrhea, abdominal pain, fecal incontinence; discontinue immediately if bloody diarrhea, severe constipation, rectal bleeding, or severe abdominal pain occur, ischemic colitis has occurred and can be fatal

**BLACK BOX WARNING:** Only clinicians enrolled in the Lotronex prescribing program should use this product; call 888-423-5227

- Geriatric women: assess for more severe side effects

### Patient/family education

**BLACK BOX WARNING:** Ischemic colitis: Teach patient to report immediately, severe constipation, bloody diarrhea, rectal bleeding or worsening abdominal pain; stop product, resume only if approved by prescriber

- Instruct patient not to double doses; if a dose is missed, it should be skipped, do not take with other meds or herbs without prescriber approval
- Advise patient that product may be taken without regard to food
- Advise patient that product does not cure disorder, but only controls symptoms
- Provide medication guide and clarify if needed, improvement in symptoms can take 1-4 wk, symptoms will occur if product is stopped
- Teach patient that product is used only for women with IBS
- Advise patient to report if pregnancy is planned or suspected; product should not be used during pregnancy—effects are unknown

### Evaluation

**Positive therapeutic outcome**

- Decreasing symptoms of IBS

## ALPRAZolam (Rx)

(al-pray'zoe-lam)

**Apo-Alpraz, Apo-Alpraz TS, Novo-Alprazol, Nu-Alpraz, Xanax, Xanax XR**

*Func. class.:* Antianxiety/sedative/hypnotic

*Chem. class.:* Benzodiazepine, short/intermediate acting

**Controlled substance schedule IV**

**Do not confuse:** ALPRAZolam/LORazepam, Xanax/Lanoxin/Tylox/Zantac

**ACTION:** Depresses subcortical levels of CNS, including limbic system, reticular formation

**Therapeutic outcome:** Decreased anxiety

**USES:** Anxiety, panic disorders with or without agoraphobia, anxiety with depressive symptoms

**Unlabeled uses:** Premenstrual dysphoric disorder, insomnia, PMS, alcohol withdrawal syndrome

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity to benzodiazepines, closed-angle glaucoma, psychosis, addiction

**Precautions:** Geriatric, debilitated, hepatic disease, obesity, severe pulmonary disease

## DOSAGE AND ROUTES

### Anxiety disorder

**Adult:** PO 0.25-0.5 mg tid, may increase q3-4days if needed, max 4 mg/day in divided doses

**Geriatric:** PO 0.125-0.25 mg bid; increase by 0.125 mg prn

### Panic disorder

**Adult:** PO 0.5 mg tid, may increase up to 1 mg/day q3-4days, max 10 mg/day; EXT REL TABS (Xanax XR) give daily in AM 0.5-1 mg initially, maintenance 3-6 mg daily

### Premenstrual dysphoric disorder (unlabeled)

**Adult:** PO 0.25 mg tid-qid, starting on day 16-18 of menses cycle, taper over 2-3 days when menses occurs, max 4 mg/day

### Hepatic dose

Reduce dose by 50%

**Available forms:** Tabs 0.25, 0.5, 1, 2 mg; ext rel tabs (Xanax XR) 0.5, 1, 2, 3 mg; orally disintegrating tabs 0.25, 0.5, 1, 2 mg; oral sol, 1 mg/ml

### Implementation

- Give with food or milk for GI symptoms; high-fat meal decreases absorption; tab may be crushed, if patient is unable to swallow medication whole, and mixed with foods or fluids; may divide total daily dose into more times/day, if anxiety occurs between doses, conversion from regular release tab to extended release is at same dose
- Give sugarless gum, hard candy, frequent sips of water for dry mouth
- Discontinue, decrease by 0.5 mg q3days
- **Orally disintegrating tabs:** Place orally disintegrating tabs on tongue to dissolve and swallow, protect from moisture, discard unused portion of tab if split
- Give ext rel tab in AM
- **Oral solution: mix with water, applesauce or other soft foods, use calibrated dropper supplied**

## ADVERSE EFFECTS

**CNS:** *Dizziness, drowsiness,* confusion, headache, anxiety, tremors, stimulation, fatigue, depression, insomnia, hallucinations, memory impairment, poor coordination, suicide
**CV:** *Orthostatic hypotension,* ECG changes, tachycardia, hypotension
**EENT:** *Blurred vision,* tinnitus, mydriasis
**GI:** Constipation, dry mouth, nausea, vomiting, anorexia, diarrhea, weight gain/loss, increased appetite, ileus perforation, ischemic colitis
**GU:** Decreased libido
**INTEG:** Rash, dermatitis, itching, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Slow, complete |
| **Distribution** | Widely distributed; crosses placenta; crosses blood-brain barrier, protein binding 80% |
| **Metabolism** | Liver, to active metabolites |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 12-15 hr immediate release, 11-16 hr extended release |

### Pharmacodynamics

| | PO | Oral Disintegrating |
|---|---|---|
| **Onset** | 1 hr | |
| **Peak** | 1-2 hr | 1.5-2 hr |
| **Duration** | 4-6 hr, therapeutic response 2-3 days | |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
Levodopa: decreased action of levodopa
Rifampin: decreased action of ALPRAZolam

### Drug classifications

Anticonvulsants, antihistamines, opioids, sedatives/hypnotics: increased CNS depression
CYP3A4 inducers (barbiturates): decreased action of ALPRAZolam
CYP3A4 inhibitors (cimetidine, disulfiram, erythromycin, fluoxetine, isoniazid, itraconazole, ketoconazole, metoprolol, propranolol, valproic acid): increased action of ALPRAZolam
Xanthines: decreased sedation

### Drug/herb

Chamomile, kava, melatonin, St. John's wort, valerian: increased CNS depression

### Drug/food

Grapefruit juice: increased product level, avoid concurrent use

### Drug/lab test

Increased: ALT, AST, alkaline phosphatase

## NURSING CONSIDERATIONS

### Assessment

- **Assess mental status:** mood, sensorium, anxiety, affect, sleeping pattern, drowsiness, dizziness, especially geriatric; physical dependency, withdrawal symptoms: anxiety, panic attacks, agitation, seizures, headache, nausea, vomiting, muscle pain, weakness;

suicidal tendencies; withdrawal seizures may occur after rapid decrease in dose or abrupt discontinuation; short duration of action makes it the product of choice in the geriatric, suicidal thoughts, behaviors
• Monitor B/P (with patient lying, standing), pulse; if systolic B/P drops 20 mm Hg, hold product, notify prescriber
• Monitor blood studies: CBC during long-term therapy; blood dyscrasias have occurred rarely; decreased hematocrit, neutropenia may occur
• Monitor hepatic studies: AST, ALT, bilirubin, creatinine LDH, alkaline phosphatase, if on long-term treatment
• Monitor I&O; indicate renal dysfunction if on long-term treatment
• **Pregnancy:** Assess if planned or suspected, not to use in pregnancy, to avoid breastfeeding
• Beers: Avoid in older adults, increased risk of cognitive impairment

### Patient/family education
• Tell patient that product may be taken with food or fluids and tabs may be crushed or swallowed whole
• Tell patient not to use for everyday stress or longer than 4 mo unless directed by prescriber; not to take more than prescribed amount; may be habit forming; not to double doses or skip doses; memory impairment is a sign of long-term use
• Tell patient to avoid OTC preparations unless approved by prescriber; alcohol and CNS depressants increase CNS depression
• **Pregnancy/breastfeeding:** Teach patient not to use during pregnancy, avoid breastfeeding
• Tell patient to avoid driving, activities that require alertness, since drowsiness may occur; to avoid alcohol ingestion or other psychotropic medications; to rise slowly, or fainting may occur, especially geriatric; that drowsiness may worsen at beginning of treatment
• Tell patient not to discontinue medication abruptly after long-term use; withdrawal symptoms include vomiting, cramping, tremors, seizures
• **Oral disintegrating:** Place on tongue and allow to dissolve, swallow, if only half of the tab is required, discard the other half
• **Oral solution:** Mix with water, soft food, juice, use measuring device supplied

### Evaluation
**Positive therapeutic outcome**
• Decreased anxiety, restlessness, sleeplessness (short-term treatment only)

## TREATMENT OF OVERDOSE:
Lavage, VS, supportive care, flumazenil

**⚠ HIGH ALERT**

## alteplase (Rx)
(al-ti-plaze′)
**Activase, Cathflo**
*Func. class.:* Thrombolytic enzyme
*Chem. class.:* Tissue plasminogen activator (TPA)

**Do not confuse:** alteplase/Altace, Activase/Cathflo Activase/TNKase

**ACTION:** Produces fibrin conversion of plasminogen to plasmin; able to bind to fibrin, convert plasminogen in thrombus to plasmin, which leads to local fibrinolysis, limited systemic proteolysis

**Therapeutic outcome:** Lysis of thrombi in MI, pulmonary emboli (life threatening)

**USES:** Lysis of obstructing thrombi associated with acute MI; conditions requiring thrombolysis (e.g., PE, unclotting arteriovenous shunts, acute ischemic CVA); central venous catheter occlusion (Cathflo)

## CONTRAINDICATIONS
Active internal bleeding, recent CVA, severe uncontrolled hypertension, intracranial/intraspinal surgery/trauma (within 3 mo), aneurysm, brain tumor, platelets $<100{,}000$ mm$^3$, bleeding diathesis including INR $>1.7$ or PT $>15$ sec, arteriovenous malformation, subarachnoid hemorrhage, intracranial hemorrhage, uncontrolled hypertension, seizure at onset of stroke

**Precautions:** Pregnancy, breastfeeding, children, geriatric, neurologic deficits, mitral stenosis, recent GI/GU bleeding, diabetic retinopathy, subacute bacterial endocarditis, arrhythmias, diabetic hemorrhage retinopathy, CVA, recent major surgery, hypertension, acute pericarditis, hemostatic defects, significant hepatic disease, septic thrombophlebitis, occluded AV cannula at seriously infected site

## DOSAGE AND ROUTES
### Pulmonary embolism (Activase)
**Adult: IV** 100 mg over 2 hr, then heparin

### Acute ischemic stroke (Activase)
**Adult: IV** 0.9 mg/kg, max 90 mg; give as INF over 1 hr, give 10% of dose **IV** BOL over 1st min

### Myocardial infarction (standard infusion)
**Adult >65 kg: IV** a total of 100 mg, given over 3 hr; 6-10 mg given **IV** BOL over 1-2 min, then the remaining 50-54 mg over the remainder of the hr, during 2nd, 3rd hr 20 mg is given by cont **IV** INF (20 mg/hr)

**Adult <65 kg: IV** 1.25 mg/kg over 3 hr; 60% in first 1 hr (10% as a bolus), remaining 40% over next 2 hr

### Myocardial infarction (accelerated infusion) (Activase)

**Adult >67 kg:** 100 mg total dose: give 15 mg **IV** BOL, then 50 mg over 30 min, then 35 mg over 60 min

**Adult <67 kg:** 15 mg **IV** BOL: then 0.75 mg/kg over 30 min (max 50 mg); 0.5 mg/kg over the next 60 min (max 35 mg)

### Occlusion prophylaxis (unlabeled) (Cathflo, Activase)

**Adult ≥30 kg:** Max 2 mg in 2 ml; may use up to 2 doses (120 min apart)

**Available forms:** Powder for inj 50 mg (29 million international units/vial), 100 mg (58 million international units/vial); Cathflo Activase: lyophilized powder for injection 2 mg

### Implementation

**Intermittent IV infusion route**

- Give after reconstituting with provided diluent; add appropriate amount of sterile water for inj (no preservatives); 20-mg vial/20 ml or 50-mg vial/50 ml (1 mg/ml); mix by slow inversion or dilute with 0.9% NaCl, $D_5W$ to a concentration of 0.5 mg/ml further dilution; 1.5 to <0.5 mg/ml may result in precipitation of product; use 18-G needle; flush line with 0.9% NaCl after administration; use reconstituted **IV** sol within 8 hr or discard, within 6 hr of coronary occlusion for best results
- Do not use 150 mg or more total dose; intracranial bleeding may occur
- Give heparin therapy after thrombolytic therapy is discontinued and when thrombin time, ACT, and APTT <2 times control (about 3-4 hr), treatment can be initiated before coagulation study results, infusion should be discontinued if pretreatment is INR >1.7, PT >15 sec, or an elevated APPT is identified
- Avoid invasive procedures, inj, rect temp; apply pressure for 30 sec to minor bleeding sites; 30 min to sites of arterial puncture, followed by pressure dressing; inform prescriber if this does not attain hemostasis; apply pressure dressing
- **Cathflo Activase:** Use this product after other options used for declotting a line; reconstitute by using 2.2 ml of sterile water provided and injecting in vial, direct flow into powder (1 mg/ml), foam will disappear after standing, swirl, do not shake, sol will be pale yellow or clear, use sol within 8 hr, instill 2 ml of reconstituted sol into occluded catheter, try to aspirate after ½ hr, if unable to remove allow 2 hrs; a second dose may be used; aspirate 5 ml of blood to remove clot and product; irrigate with normal saline
- Store powder at room temperature or refrigerate; protect from excessive light
- Avoidance of invasive procedures, inj, rectal temp
- Pressure for 30 sec to minor bleeding sites; 30 min to sites of atrial puncture followed by pressure dressing; inform prescriber if this does not attain hemostasis; apply pressure dressing

**Y-site compatibilities:** Eptifibatide, lidocaine, metoprolol, propranolol

**Y-site incompatibilities:** DOBUTamine, DOPamine, heparin, nitroglycerin

## ADVERSE EFFECTS

**CV:** Sinus bradycardia, ventricular tachycardia, accelerated idioventricular rhythm, bradycardia, recurrent ischemic stroke, cholesterol microembolization, hypotension
**EENT:** Orolingual angioedema
**INTEG:** Urticaria, rash
**SYST:** GI, GU, intracranial, retroperitoneal bleeding, *surface bleeding*, anaphylaxis, fever

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete |
| **Distribution** | Unknown |
| **Metabolism** | >80% liver |
| **Excretion** | Kidneys |
| **Half-life** | 35 min |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Immediate |

## INTERACTIONS

### Individual drugs

Abciximab, clopidogrel, dipyridamole, eptifibatide, plicamycin, ticlopidine, tirofiban, valproic acid: increased bleeding
ACE inhibitors: increased orolingual angioedema
Nitroglycerin: decreased effect, avoid concurrent use

### Drug classifications

Anticoagulants (oral), cephalosporins (some), NSAIDs, salicylates: increased bleeding

### Drug/herb

Feverfew, garlic, ginger, ginkgo, ginseng, green tea: increased risk of bleeding

### Drug/lab test

Increased: PT, APTT, TT

## NURSING CONSIDERATIONS

### Assessment

• Treatment is not recommended in patient with acute ischemic stroke >3 hr after symptom onset, with minor neurologic deficit, or with rapidly improving symptoms

• Monitor VS q15min, B/P, pulse, respirations (including peripheral), neurologic signs, temp at least q4hr; temp >104° F (40° C) indicates internal bleeding; monitor rhythm closely; ventricular dysrhythmias may occur with hyperfusion; monitor heart, breath sounds, neurologic status, and peripheral pulses, those with severe neurologic deficit (NIHSS >22) at presentation (increased risk of hemorrhage)

• **Assess for bleeding during first hr of treatment and 24 hr after procedure:** hematuria, hematemesis, bleeding from mucous membranes, epistaxis, ecchymosis, puncture sites; guaiac all body fluids and stools; obtain blood studies (Hct, platelets, PTT, PT, TT, APTT) before starting therapy; PT or APTT must be <2 times control before starting therapy; TT or PT q3-4hr during treatment; obtain CPK-MB to identify product effectiveness; do not use in severe uncontrolled hypertension, aneurysm, head trauma, for MI, pulmonary embolism

• **Assess hypersensitivity:** fever, rash, facial swelling, dyspnea, itching, chills; mild reaction may be treated with antihistamines; report to prescriber

• **Occlusion:** have patient exhale then hold breath when connecting/disconnecting syringe to prevent air embolism

• **Cholesterol embolism:** assess for purple toe syndrome, acute renal failure, gangrenous digits, hypertension, livedo reticularis, pancreatitis, MI, cerebral infarction, spinal cord infarction, retinal artery occlusion, bowel infarction, rhabdomyolysis

• **Myocardial infarction:** monitor ECG; on monitor, watch for segment changes, changes in rhythm: sinus bradycardia, ventricular tachycardia, accelerated idioventricular rhythm may occur due to reperfusion, cardiac enzymes, radionuclide myocardial scanning/coronary angiography

• **Pulmonary embolism:** monitor pulse, B/P, ABGs, rate/rhythm of respirations; symptoms include dyspnea, tachypnea, chest pain, cough, hemoptysis

• **Pregnancy/breastfeeding:** Usually considered contraindicated in pregnancy except in serious conditions, use cautiously in breastfeeding

### Patient/family education

• Teach patient reason for alteplase, signs and symptoms of bleeding, allergic reactions, when to notify prescriber

### Evaluation

**Positive therapeutic outcome**

• Lysis of pulmonary thrombi
• Adequate hemodynamic state
• Absence of congestive heart failure

## aluminum hydroxide (OTC)

**Alugel, Alu-Tab, Amphojel, Basaljel**

*Func. class.:* Antacid, hypophosphatemic, antiulcer

*Chem. class.:* Aluminum product, phosphate binder

**ACTION:** Neutralizes gastric acidity, binds phosphates in GI tract; these phosphates are excreted

**Therapeutic outcome:** Decreased acidity, healing of ulcers; decreased phosphate levels in chronic renal failure

**USES:** Antacid, adjunct in peptic, gastric, duodenal ulcers; hyperphosphatemia in chronic renal failure; reflux esophagitis, hyperacidity, heartburn, stress ulcer prevention in critically ill, GERD

**Unlabeled uses:** GI bleeding

## CONTRAINDICATIONS

Hypersensitivity to this product or aluminum products

**Precautions:** Pregnancy, breastfeeding, geriatric, fluid restriction, decreased GI motility, GI obstruction, dehydration, renal disease, sodium-restricted diets, GI bleeding, hypokalemia

## DOSAGE AND ROUTES

### Antacid

**Adult:** SUSP PO 500-1500 mg 3-6 times/day; max 6 times/day

### Hyperphosphatemia

**Adult:** PO 300-600 mg tid
**Child:** PO 50-150 mg/kg/day in 4-6 divided doses

**Available forms:** SUSP 320 mg/5 ml, 600 mg/5 ml

### Implementation

• 2 tsp (10 ml) neutralizes 20 mEq of acid

**PO route**

• Give laxatives or stool softeners if constipation occurs, especially geriatric

• Give after shaking suspension; follow with water to facilitate passage
• Tab may be chewed if patient is unable to swallow, drink 8 oz of water after chewing; or by nasogastric tube if patient unable to swallow
• Give with 8 oz of water for hyperphosphatemia unless contraindicated
• Give 1 hr before or after other medications to prevent poor absorption
• Give 15 ml 30 min after meals and at bedtime (esophagitis)

**NG tube route**

• May be given as prescribed q1-2hr and given by gastric tube after diluting with water (peptic ulcer)

## ADVERSE EFFECTS

**GI:** *Constipation,* anorexia, obstruction, fecal impaction
**META:** *Hypophosphatemia,* hypercalciuria, hypomagnesemia, aluminum toxicity

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Not usually absorbed |
| **Distribution** | Widely distributed if absorbed; crosses placenta |
| **Metabolism** | Unknown |
| **Excretion** | Feces, kidneys (small amounts), breast milk |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 20-40 min |
| **Peak** | ½ hr |
| **Duration** | 1-3 hr |

## INTERACTIONS

### Individual drugs

Allopurinol, amprenavir, delavirdine, digoxin, gabapentin, gatifloxacin, isoniazid, ketoconazole, penicillamine, phenytoin, quiNIDine, ticlopidine: decreased effect of each of these drugs

### Drug classifications

Anticholinergics, cephalosporins, corticosteroids, $H_2$ antagonists, iron salts, phenothiazines, quinolones, tetracyclines, thyroid hormones: decreased effect of each of these drug classifications

### Drug/food

High-protein meal: decreased product effect

### Drug/lab test

Decreased: Phosphate Interference: Tc-99m

## NURSING CONSIDERATIONS

### Assessment

• Assess pain symptoms: location, duration, intensity, alleviating/precipitating factors
• Monitor phosphate levels, since product is bound in GI system; urinary pH, calcium, electrolytes; hypophosphatemia: anorexia, weakness, fatigue, bone pain, hyperreflexia
• Monitor constipation; increase bulk in diet if needed, may use stool softeners or laxatives; record amount and consistency of stools
• **Monitor aluminum toxicity:** severe renal disease; may also be used for hyperphosphatemia
• **Pregnancy/breastfeeding:** Usually considered safe if used occasionally at recommended dose in pregnancy, breastfeeding

### Patient/family education

• Instruct patient to avoid phosphate-containing foods (most dairy products, eggs, fruits, carbonated beverages) during product therapy; to add cheese, corn, pasta, plums, prunes, lentils after product (hypophosphatemia)
• Instruct patient not to use for prolonged periods if serum phosphate is low or if on a low-sodium diet, shake liquid well; HF patients should check for sodium content and use sodium-reduced products
• Instruct patient that stools may appear white or speckled; constipation may result; to report black tarry stools, which indicate gastric bleeding
• Instruct patient to check with prescriber after 2 wk of self-prescribed antacid use; may be used for 4-6 wk after symptoms subside or as prescribed
• Instruct patient to separate other medications by 2 hr
• Teach patient to notify prescriber of black tarry stools, which may indicate bleeding

### Evaluation

**Positive therapeutic outcome**

• Absence of pain, decreased acidity
• Increased pH of gastric secretions
• Decreased phosphate levels

## alvimopan (Rx)

(al-vi′moe-pan)
**Entereg**
*Func. class.:* Functional GI disorder agent
*Chem. class.:* Peripheral μ-opioid receptor antagonist

**ACTION:** Acts within the GI tract, antagonizes opioid-induced GI dysfunction

**Therapeutic outcome:** Resolution of ileus

**USES:** Ileus, postoperative

## CONTRAINDICATIONS

Hypersensitivity, those who have taken therapeutic doses of opioids for 7 consecutive days immediately before starting this product

**Precautions:** Pregnancy, breastfeeding, renal/hepatic disease, children, GI obstruction, complete GI obstruction surgery, risk of MI

**BLACK BOX WARNING:** MI, requires a specialized care setting

## DOSAGE AND ROUTES

### Ileus, postoperative

**Adult:** PO 12 mg given ½-5 hr before surgery, then 12 mg bid beginning the day after surgery, max 7 days (15 doses)

### Renal/hepatic dose

**Adult:** PO Do not use in end-stage renal disease or Child-Pugh

**Available forms:** Caps 12 mg

### Implementation

- Use in hospital only; therapeutic doses of opiates should not be used for >7 consecutive days
- Must register in EASE program
- Do not give >15 doses (short-term hospital only)
- Give without regard to food
- Store at room temperature

**BLACK BOX WARNING:** Use only in hospital setting approved for ENTEREG Access Support and Education (EASE) Program

## ADVERSE EFFECTS

**CV:** MI
**GI:** *Dyspepsia,* flatulence, *constipation,* diarrhea, abdominal pain, cramping
**GU:** Urinary retention
**MISC:** Anemia, hypokalemia
**MS:** Back pain

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | High-fat meal decreases absorption |
| **Distribution** | Protein binding 80%-94% |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys (35%) |
| **Half-life** | Terminal 10-18 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Amiodarone, bepridil, cycloSPORINE, diltiazem, itraconazole, quiNIDine, quinine, spironolactone, verapamil: increased alvimopan effect
Methylnaltrexone: duplicate therapy

### Drug classifications

**BLACK BOX WARNING:** Opiate agonists: increased GI adverse reactions; do not give if opiate agonists were taken for ≥7 days

Opiate antagonists: duplicate therapy, do not use concurrently

## NURSING CONSIDERATIONS

### Assessment

- Monitor Hgb, Hct, serum potassium; hyperkalemia occurs

**BLACK BOX WARNING:** Opiate use for chronic pain; MI is more common in this population

- **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding, excretion unknown

### Patient/family education

- Instruct the patient in the reason for the product
- **Pregnancy/breastfeeding:** To notify provider if pregnancy is planned or suspected, to avoid breastfeeding
- Advise patient that product is only used for a limited time (<7 days) in a hospital setting
- Advise patient to report constipation, abdominal pain, cramping, nausea, vomiting

### Evaluation

**Positive therapeutic outcome**

- Resolution of postoperative ileus

## amantadine (Rx)

(a-man'ta-deen)
**Endantadine, Gocovri, Symmetrel**
*Func. class.:* Antiviral, antiparkinsonian agent
*Chem. class.:* Tricyclic amine

**Do not confuse:** amantadine/ranitidine/rimantadine/amiodarone

**ACTION:** Prevents uncoating of nucleic acid in viral cell, preventing penetration of virus to host; causes release of dopamine from neurons

**Therapeutic outcome:** Resolution of infection, lessening of parkinsonism symptoms

**USES:** Prophylaxis or treatment of influenza type A, extrapyramidal reactions, parkinsonism, Parkinson's disease

## CONTRAINDICATIONS

Breastfeeding, child <1 yr, hypersensitivity, eczematic rash

**Precautions:** Pregnancy, geriatric, epilepsy, HF, orthostatic hypotension, psychiatric disorders, renal/hepatic disease, peripheral edema, CV disease

## DOSAGE AND ROUTES

### Parkinson's disease

**Adult:** PO 100 mg bid (monotherapy) if other antiparkinson's products are used in high doses, start at 100 mg qday, increase to 100 mg bid after 7 days, may increase to 400 mg in divided doses per day

### Influenza type A

Begin within 24-48 hr of symptoms and continue for 24-48 hr after symptoms disappear

**Adult and child ≥13 yr:** PO 200 mg/day in single dose or divided bid

**Geriatric:** PO no more than 100 mg/day

**Child 9-12 yr:** PO 100 mg bid

**Child 1-8 yr:** PO 4.4-8.8 mg/kg/day divided bid-tid, max 150 mg/day

### Drug-induced EPS

**Adult:** PO 100 mg bid up to 300 mg/day in divided doses

### Amantadine dose addition

For the treatment of dyskinesia associated with Parkinson's disease in patients receiving levodopa-based therapy, with or without concomitant dopaminergic medications

**Adults (Gocovri ER Cap only):** PO 137 mg qday at bedtime initially, then after 1 wk, increase to 274 mg qday at bedtime.

### Renal dose

**Adult:** PO CCr 30-50 ml/min 200 mg first day, then 100 mg/day; CCr 15-29 ml/min 100 mg first day, then 100 mg on alternate days; CCr 15 ml/min reduce dose and interval to 200 mg q7days

**Available forms:** Caps 100 mg; oral sol 50 mg/5 ml, tab 100 mg; ER capsule (Gocovri) 68.5, 137 mg

### Implementation

- **Prophylaxis:** give before exposure to influenza; continue for 10 days after contact; **treatment:** initiate within 24-48 hr after onset of symptoms, continue for 24-48 hr after symptoms disappear
- Give at least 4 hr before bedtime to prevent insomnia
- Give after meals for better absorption, to decrease GI symptoms
- Give in divided doses to prevent CNS disturbances: headache, dizziness, fatigue, drowsiness
- Store in tight, dry container
- Caps may be opened and mixed with food
- For the treatment of dyskinesia associated with Parkinson's disease in patients receiving levodopa-based therapy, with or without concomitant dopaminergic medications
- Adults (Gocovri ER Cap only): PO 137 mg qday at bedtime initially, then after 1 wk, increase to 274 mg qday at bedtime.

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness*, drowsiness, fatigue, *anxiety,* psychosis, *depression, hallucinations,* tremors, seizures, confusion, *insomnia*

**CV:** *Orthostatic hypotension,* HF

**EENT:** Blurred vision

**GI:** *Nausea, vomiting,* constipation, dry mouth, anorexia

**GU:** *Frequency, retention*

**HEMA:** Leukopenia, agranulocytosis

**INTEG:** Photosensitivity, dermatitis, livedo reticularis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Crosses placenta |
| **Metabolism** | Not metabolized |
| **Excretion** | Urine unchanged (90%), breast milk |
| **Half-life** | 11-15 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 48 hr |
| **Peak** | 2-4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Atropine: increased anticholinergic response

H1N1 influenza A virus vaccine: decreased effect of vaccine; avoid use 2 wk before or 48 hr after amantadine

Metoclopramide: decreased amantadine effect

Triamterene, hydrochlorothiazide: decreased excretion of amantadine

### Drug classifications

Anticholinergics (other): increased anticholinergic response

CNS stimulants: increased CNS stimulation

Phenothiazines: decreased amantadine effect

### Drug/lab test

Increase: BUN, creatinine, alk phos, CK, LDH, bilirubin, AST, ALT, GGT

## NURSING CONSIDERATIONS

### Assessment

- Mental status: may cause increased psychiatric disorders, especially in the elderly
- Assess **HF,** confusion, mottling of skin
- Assess bowel pattern before, during treatment
- Assess skin eruptions, photosensitivity after administration of product

- Serum creatinine, BUN in renal impairment
- Assess signs of infection
- Assess for **livedo reticularis:** mottling of the skin, usually red, edema, itching in lower extremities, usually in Parkinson's disease
- Assess for **Parkinson's disease:** gait, tremors, akinesia, rigidity, may be effective if anticholinergics have not been effective
- **Assess for toxicity:** confusion, behavioral changes, hypotension, seizures

### Patient/family education

- Advise patient to change body position slowly to prevent orthostatic hypotension
- Teach about aspects of product therapy: need to report dyspnea, weight gain, dizziness, poor concentration, dysuria, complex sleep behaviors
- Advise patient to avoid hazardous activities if dizziness, blurred vision occurs
- Advise patient to take product exactly as prescribed; parkinsonian crisis may occur if product is discontinued abruptly; do not double dose; if a dose is missed, do not take within 4 hr of next dose
- Teach to avoid alcohol

### Evaluation

**Positive therapeutic outcome**

- Absence of fever, malaise, cough, dyspnea in infection; tremors, shuffling gait in Parkinson's disease

## TREATMENT OF OVERDOSE:

Withdraw product, maintain airway, administer EPINEPHrine, aminophylline, $O_2$, **IV** corticosteroids, physostigmine

## ambrisentan (Rx)

(am-bri-sen'tan)
**Letairis, Volibris**
*Func. class.:* Antihypertensive
*Chem. class.:* Vasodilator/endothelin receptor antagonist

## ACTION:

Endothelin-1A receptor antagonist; endothelin-1A is vasoconstrictor

**Therapeutic outcome:** Decreased shortness of breath, dizziness

## USES:

Pulmonary arterial hypertension, alone or in combination with other antihypertensives in WHO class II (significant exertion), III (mild exertion)

## CONTRAINDICATIONS

Breastfeeding, hypersensitivity

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Children, women, geriatric, hepatitis, anemia, heart failure, jaundice, peripheral edema, hepatic disease, pulmonary edema

## DOSAGE AND ROUTES

**Adult:** PO 5 mg/day; may increase q4wk to 10 mg if needed

### Hepatic dose

**Adult:** Discontinue if AST/ALT >5 or if elevations are accompanied by bilirubin >2 ULN or other signs of liver dysfunction

**Available forms:** Tabs 5, 10 mg

### Implementation

- Do not break, crush, or chew tabs
- Give daily with a full glass of water without regard to food
- Do not discontinue abruptly

**BLACK BOX WARNING:** Only those facilities enrolled in the LEAP program (866-664-5327) may administer this product

- Store in tight container at room temperature

## ADVERSE EFFECTS

**CNS:** Headache, fever, flushing, fatigue
**CV:** Orthostatic hypotension, hypotension, peripheral edema, palpitations
**EENT:** Sinusitis, rhinitis
**GI:** Abdominal pain, constipation, anorexia, hepatotoxicity
**GU:** Decreased sperm counts
**HEMA:** Anemia
**INTEG:** Rash, angioedema
**RESP:** Pharyngitis, dyspnea, pulmonary edema, venoocclusive disease (VOD)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid |
| **Distribution** | Protein binding 99% |
| **Metabolism** | By CYP3A4, CYP2C19, UGTa |
| **Excretion** | Unknown |
| **Half-life** | Terminal 15 hr, effective half-life 9 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Cimetidine, clopidogrel, efavirenz, felbamate, FLUoxetine, modafinil, OXcarbazepine, ticlopidine: possibly increased ambrisentan
Mefloquine, niCARdipine, propafenone, quiNIDine, ranolazine, tacrolimus, testosterone: decreased ambrisentan absorption

### Drug classifications

Antihypertensives (other), diuretics, MAOIs: increased hypotension
Barbiturates: need for ambrisentan dosage change
CYP3A4 inhibitors (amprenavir, aprepitant, atazanavir, clarithromycin, conivaptan, cyclosporine, dalfopristin, danazol, darunavir, erythromycin, estradiol, imatinib, itraconazole, ketoconazole, nefazodone, nelfinavir, propoxyphene, quinupristin, ritonavir, RU-486, saquinavir, tamoxifen, telithromycin, troleandomycin, zafirlukast), CYP2C19/CYP3A4 (chloramphenicol, delavirdine, fluconazole, fluvoxaMINE, isoniazid, voriconazole): increased ambrisentan
CYP3A4 inducers (carBAMazepine, PHENobarbitol, phenytoin, rifampin): decreased ambrisentan

### Drug/herb

Ephedra (ma huang), St. John's wort: need for ambrisentan dosage change

### Drug/food

Grapefruit products: avoid use

### Drug/lab test

Decreased: Hct, Hgb
Increased: LFTs

## NURSING CONSIDERATIONS

### Assessment

- Assess pulmonary status: improvement in breathing, ability to exercise; pulmonary edema that may indicate venoocclusive disease
- Monitor blood studies: CBC with differential; Hct, Hgb may be decreased
- Monitor liver function tests: AST, ALT, blirubin

**BLACK BOX WARNING:** Assess pregnancy status before giving this product and monthly

- **Hepatotoxicity:** assess for nausea, vomiting, pain/cramping, jaundice, anorexia, itching
- Beers: Use in older adults cautiously, may exacerbate syncope

### Patient/family education

- Teach patient the importance of complying with dosage schedule even if feeling better
- Advise patient that if a dose is missed, take as soon as possible; if it is almost time for the next dose, take only that dose; do not double dose
- Instruct patient not to use OTC products, including herbs, supplements unless approved by prescriber
- **Advise patient to report to prescriber immediately:** dizziness, faintness, chest pain, palpitations, uneven or rapid heart rate, headache, edema, weight gain
- Caution patient not to operate machinery or perform hazardous tasks if dizziness occurs
- Advise patient to avoid faintness; do not get up or stand up rapidly

**BLACK BOX WARNING:** To notify if pregnancy is planned or suspected; if pregnant, product will need to be discontinued, pregnancy test done monthly, to use two contraception methods while taking this product

- To report hepatic dysfunction: nausea/vomiting, anorexia, fatigue, jaundice, right upper quadrant abdominal pain, itching, fever, malaise
- Advise patient of importance of follow-up with labs

### Evaluation

**Positive therapeutic outcome**

- Decrease in B/P
- Decreased shortness of breath

## amikacin (Rx)

(am-i-kay'sin)
*Func. class.:* Antibiotic
*Chem. class.:* Aminoglycoside

**Do not confuse:** Amikacin/Anakinra

**ACTION:** Interferes with protein synthesis in bacterial cell by binding to ribosomal subunit, which causes misreading of genetic code; inaccurate peptide sequence forms in protein chain, causing bacterial death

**Therapeutic outcome:** Bactericidal effects for the following organisms: *Pseudomonas aeruginosa, Escherichia coli, Enterobacter, Acinetobacter, Providencia, Citrobacter, Staphylococcus, Serratia, Proteus*

**USES:** Severe systemic infections of CNS, respiratory, GI, urinary tract, bone, skin, soft tissues caused by *Staphylococcus aureus (MSSA), Pseudomonas aeruginosa, Escherichia coli, Enterobacter, Acinetobacter, Providencia, Citrobacter, Serratia, Proteus, Klebsiella pneumoniae*

**Unlabeled uses:** *Mycobacterium avium* complex (intrathecal or intraventricular) in combination; actinomycotic mycetoma, cystic fibrosis

## CONTRAINDICATIONS

Pregnancy, hypersensitivity to aminoglycosides, sulfites

**Precautions:** Neonates, breastfeeding, geriatric, myasthenia gravis, Parkinson's disease, dehydration, mild to moderate infections

**BLACK BOX WARNING:** Hearing impairment, renal/neuromuscular disease

## DOSAGE AND ROUTES

**Severe systemic infections:** *(Pseudomonas aeruginosa, Escherichia coli, Proteus, Klebsiella, Staphylococcus)*

**Adult and child: IV** INF 10-15 mg/kg/day in 2-3 divided doses q8-12hr in 100-200 ml $D_5W$ over 30-60 min, not to exceed 1.5 g/day; **pulse dosing** (once-daily dosing) may be used with some infections; IM 10-15 mg/kg/day in divided doses q8-12hr; or extended internal dosing as an alternative dosing regimen

**Neonate:** IM/**IV** 10 mg/kg initially, then 7.5 mg/kg q12hr

### Severe urinary tract infections

**Adult:** IM 10-15 mg/kg/day divided q8-12hr

### Hemodialysis

**Adult:** IM/**IV** 7.5 mg/kg followed by 5 mg/kg 3 ×/wk after each dialysis session (for TIW dialysis)

### Mycobacterium avian complex (unlabeled)

**Adult and adolescent: IV** 7.5-15 mg/kg divided q12-24hr as part of a multiple-drug regimen

**Child: IV** 15-30 mg/kg/day divided q12-24hr as part of a multiple-drug regimen, max 1.5 g/day

### Renal dose (extended interval dosing)

**Adult:** IV/IM CCr 40-59 ml/min 15 mg/kg IV q36hr; CCr 20-39 ml/min 15 mg/kg IV q48hr; <20 ml/min adjust based on serum concentrations and MIC (use traditional dosing)

### Traditional dosing

- Decrease dose and maintain interval or maintain dose and decrease interval

**Available forms:** Inj IM, **IV** 50, 250 mg/ml

### Implementation

- Obtain C&S before administration, begin treatment before results

**IM route**

- Give deeply in large muscle mass, rotate inj sites
- Obtain peak 1 hr after IM, trough before next dose

**Intermittent IV INF route**

- **Dilute** 500 mg of product/100-200 ml of **IV** $D_5W$, 0.9% NaCl and **give** over ½-1 hr; dilute insufficient volume to allow inf over 1-2 hr (infants); **flush** after administration with $D_5W$ or 0.9% NaCl; solution is clear or pale yellow; discard if precipitate or dark color develops
- In children, amount of fluid depends on ordered dose; in infants infuse over 1-2 hr
- Give in evenly spaced doses to maintain blood level

**Y-site compatibilities:** Acyclovir, alatrofloxacin, aldesleukin, alemtuzumab, alfentanil, amifostine, aminophylline, amiodarone, amsacrine, anidulafungin, argatroban, ascorbic acid, atracurium, atropine, aztreonam, benztropine, bivalirudin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, ceFAZolin, cefepime, cefonicid, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, cisatracurium, CISplatin, clindamycin, codeine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doripenem, doxacurium, DOXOrubicin, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, epoetin alfa, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, famotidine, fentaNYL, filgrastim, fluconazole, fludarabine, fluorouracil, foscarnet, furosemide, gemcitabine, gentamicin, glycopyrrolate, granisetron, hydrocortisone, HYDROmorphone, IDArubicin, ifosfamide, IL-2, imipenem-cilastatin, isoproterenol, ketorolac, labetalol, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, metaraminol, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, mitoXANtrone, morphine, multivitamins, nafcillin, nalbuphine, naloxone, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pantoprazole, papaverine, PEMEtrexed, penicillin G, pentazocine, perphenazine, PHENobarbital, phenylephrine, phytonadione, piperacillin-tazobactam, potassium chloride, procainamide, prochlorperazine, promethazine, propranolol, protamine, pyridoxime, quinupristin-dalfopristin, ranitidine, remifentanil, riTUXimab, rocuronium, sargramostim, sodium acetate, sodium bicarbonate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin/clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, voriconazole, warfarin, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CNS:** Confusion, depression, numbness, tremors, seizures, muscle twitching, neurotoxicity, dizziness, vertigo, tinnitus, neuromuscular blockade with respiratory paralysis

**CV:** Hypotension or hypertension

**EENT:** Ototoxicity, deafness
**GI:** *Nausea, vomiting, anorexia,* bilirubin
**GU:** Oliguria, hematuria, renal damage, azotemia, renal failure, nephrotoxicity
**HEMA:** Eosinophilia, anemia
**INTEG:** *Rash,* burning, urticaria, dermatitis, alopecia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (IM), completely absorbed (**IV**) |
| **Distribution** | Widely distributed in extracellular fluids, poor in CSF; crosses placenta |
| **Metabolism** | Minimal; liver |
| **Excretion** | Mostly unchanged (79%) in kidneys, removed by hemodialysis |
| **Half-life** | 2-3 hr, prolonged up to 7 hr in infants; increased in renal disease |

### Pharmacodynamics

| | IM | IV |
|---|---|---|
| **Onset** | Rapid | Rapid |
| **Peak** | 15-30 min | 1-2 hr |
| **Duration** | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

**BLACK BOX WARNING:** Acyclovir, amphotericin B, cidofovir, cycloSPORINE, vancomycin: nephrotoxicity

**BLACK BOX WARNING:** DimenhyDRINATE, ethacrynic acid: increased masking of ototoxicity

### Drug classifications

**BLACK BOX WARNING:** Anesthetics, nondepolarizing neuromuscular blockers: increased neuromuscular blockade, respiratory depression

**BLACK BOX WARNING:** Increased: Ototoxic-to-IV loop diuretics

**BLACK BOX WARNING:** Cephalosporins: inactivation of amikacin, nephrotoxicity

NSAIDs: increased serum trough and peak

### Drug/lab test

Increased: BUN, creatinine, urea levels (urine)

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for previous sensitivity reaction
- Assess patient for signs and symptoms of infection, including characteristics of wounds, sputum, urine, stool, WBC $>10{,}000/mm^3$, earache, temp; obtain baseline information before and during treatment
- Assess for allergic reactions: rash, urticaria, pruritus

**BLACK BOX WARNING:** Nephrotoxicity: Assess renal impairment; obtain urine for CCr, BUN, serum creatinine; lower dosage should be given in renal impairment; nephrotoxicity may be reversible if product is stopped at first sign

- Notify prescriber of increased BUN and creatinine, urine CCr $<80$ ml/min; urinalysis daily for protein, cells, casts
- Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase; Coombs' test monthly if patient is on long-term therapy
- Monitor electrolytes: potassium, sodium, chloride, magnesium monthly if patient is on long-term therapy
- Assess bowel pattern daily; if severe diarrhea occurs, product should be discontinued
- Monitor for bleeding: ecchymosis, bleeding gums, hematuria, stool guaiac daily if on long-term therapy
- Assess for **overgrowth of infection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum
- Obtain weight before treatment; calculation of dosage is usually based on ideal body weight but may be calculated on actual body weight, in those underweight and nonobese, use total body weight (TBW) instead of ideal body weight
- Monitor VS during infusion, watch for hypotension, change in pulse
- Assess **IV** site for thrombophlebitis including pain, redness, swelling q30min; change site if needed; apply warm compresses to discontinued site

**BLACK BOX WARNING:** Ototoxicity: Deafness by audiometric testing, ringing, roaring in ears, vertigo; assess hearing before, during, after treatment

- **Dehydration:** high specific gravity, decrease in skin turgor, dry mucous membranes, dark urine
- **Vestibular dysfunction:** nausea, vomiting, dizziness, headache; product should be discontinued if severe

• **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected or if breastfeeding; do not use in pregnancy or breastfeeding

### Patient/family education

• Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
• Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate superinfection
• Advise patient to report hypersensitivity: rash, itching, trouble breathing, facial edema and notify prescriber

**BLACK BOX WARNING:** Neuromuscular blockade; respiratory paralysis may occur, more common in those receiving anesthetics, neuromuscular blockers, use of calcium salts may reverse effect

### Evaluation

**Positive therapeutic outcome**

• Absence of signs/symptoms of infection: WBC $<10{,}000/mm^3$, temp WNL; absence of red draining wounds; absence of earache
• Reported improvement in symptoms of infection

## TREATMENT OF OVERDOSE:

Withdraw product; administer EPINEPHrine, $O_2$, hemodialysis, exchange transfusion in the newborn; monitor serum levels of product; may give ticarcillin or carbenicillin

## aMILoride (Rx)

(a-mill'oh-ride)
**Apo-Amilzide, Midamor, Moduretic, Novamilor, Nu-Amilzide**
*Func. class.:* Potassium-sparing diuretic
*Chem. class.:* Pyrazine

**Do not confuse:** aMILoride/amLODIPine/amiodarone

**ACTION:** Inhibits sodium, potassium ATPase ion exchange in the distal tubule, cortical collecting duct resulting in inhibition of sodium reabsorption and decreasing potassium secretion

**Therapeutic outcome:** Diuretic and antihypertensive effect while retaining potassium

**USES:** Edema in HF in combination with other diuretics; for hypertension, adjunct with other diuretics to maintain potassium

**Unlabeled uses:** Ascites

## CONTRAINDICATIONS

Anuria, hypersensitivity, diabetic neuropathy, renal failure

**BLACK BOX WARNING:** Hyperkalemia

**Precautions:** Pregnancy, breastfeeding, children, geriatric, dehydration, diabetes, acidosis, respiratory hyponatremia, impaired renal function

## DOSAGE AND ROUTES

**Adult:** PO 5-10 mg daily in 1-2 divided doses; may be increased to 10-20 mg daily if needed
**Infant/child (6-20 kg):** PO 0.625 mg/kg/day

### Renal dose

**Adult:** PO CCr 10-50 ml/min reduce dose by 50%; however, avoid if possible, CCr <10 ml/min contraindicated

**Available forms:** Tabs 5 mg

### Implementation

• Give in AM to avoid interference with sleep
• With food; if nausea occurs, absorption may be increased

## ADVERSE EFFECTS

**CNS:** *Headache,* dizziness, fatigue, weakness, paresthesias, tremor, depression, anxiety, encephalopathy
**CV:** Orthostatic hypotension, dysrhythmias, angina
**EENT:** Blurred vision, increased intraocular pressure
**ELECT:** Hyperkalemia, dehydration, hyponatremia, hypochloremia
**GI:** *Nausea, diarrhea,* dry mouth, *vomiting, anorexia,* cramps, constipation, abdominal pain, jaundice
**GU:** *Polyuria,* dysuria, frequency, impotence
**HEMA:** Aplastic anemia, neutropenia
**INTEG:** *Rash, pruritus,* alopecia, urticaria
**MS:** *Cramps*
**RESP:** *Cough, dyspnea,* shortness of breath

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Variable (10%-50%) |
| **Distribution** | Widely distributed |
| **Metabolism** | Unchanged in urine (50%), in feces (40%) |
| **Excretion** | Renal; breast milk |
| **Half-life** | 6-9 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 2 hr |
| **Peak** | 6-10 hr |
| **Duration** | 24 hr |

## INTERACTIONS

### Individual drugs

**BLACK BOX WARNING:** CycloSPORINE, tacrolimus: increased hyperkalemia

Lithium: increased lithium toxicity, monitor lithium levels

### Drug classifications

**BLACK BOX WARNING:** Hyperkalemia: ACE inhibitors, diuretics (potassium-sparing), potassium products, salt substitutes: increased hyperkalemia. Avoid concurrent use; if using together, monitor K level

Antihypertensives: increased action
NSAIDs: decreased effectiveness of aMILoride, avoid concurrent use

### Drug/herb

Hawthorn, horse chestnut: increased aMILoride effect

### Drug/food

Potassium foods: increased hyperkalemia, potassium-based salt substitutes

### Drug/lab test

**BLACK BOX WARNING:** Interference: GTT

Increased: LFTs, BUN, potassium, sodium

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Monitor for **hyperkalemia:** *MS:* fatigue, muscle weakness; *CARDIAC:* dysrhythmias, hypotension; *NEURO:* paresthesias, confusion; *RESP:* dyspnea, monitor potassium level baseline and each dosage change, hyperkalemia is more common in renal disease, geriatrics, diabetes, if potassium ≥ 5.5 mEq/L immediately notify prescriber

- Monitor for **hypokalemia:** weakness, polyuria, polydipsia, fatigue, ECG U wave
- Assess fluid volume status: distended red veins, crackles in lung, color, quality, and specific gravity of urine, skin turgor, adequacy of pulses, moist mucous membranes, bilateral lung sounds, peripheral pitting edema; dehydration symptoms of decreasing output, thirst, hypotension, dry mouth and mucous membranes should be reported
- Monitor electrolytes: potassium, sodium, calcium, magnesium; also include BUN, ABGs, uric acid, CBC, blood glucose
- Assess B/P before, during therapy with patient lying, standing, and sitting as appropriate; orthostatic hypotension can occur rapidly
- **Beers:** Avoid in older adults, may decrease sodium, increase potassium, decrease creatinine clearance; use with caution may exacerbate or cause inappropriate antidiuretic hormone secretion/hyponatremia, monitor sodium levels often
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected or if breastfeeding, use only if clearly needed.

### Patient/family education

- Teach patient to take medication early in the day to prevent nocturia, to avoid alcohol
- Instruct patient to take with food or milk if GI symptoms of nausea and anorexia occur
- Teach patient to maintain a weekly record of weight and notify prescriber of weight loss >5 lb
- Caution patient that this product causes an increase in potassium levels, so foods high in potassium and potassium supplements should be avoided; refer to dietitian for assistance, planning
- Caution patient not to exercise in hot weather or stand for prolonged periods since orthostatic hypotension is enhanced
- Teach patient not to use alcohol or any OTC medications without prescriber's approval; serious product reactions may occur
- Emphasize the need to contact prescriber immediately if muscle cramps, weakness, nausea, dizziness, or numbness occurs
- Teach patient to take own B/P and pulse and record
- Advise patient that dizziness and confusion may occur; avoid driving or other hazardous activities if alertness is decreased
- Teach patient to continue taking medication even if feeling better; this product controls symptoms but does not cure the condition
- Advise patient with hypertension to continue other medical treatment (exercise, weight loss, relaxation techniques, cessation of smoking)
- Teach patient to avoid hazardous activities if dizziness occurs

### Evaluation

**Positive therapeutic outcome**

- Prevention of hypokalemia (diuretic use)
- Decreased edema
- Decreased B/P
- Increased diuresis

## TREATMENT OF OVERDOSE:

Lavage if taken orally; monitor electrolytes; administer **IV** fluids; monitor hydration, CV, renal status

## amino acid (Rx)

(a-mee′noe)

**Injection: FreAmine, HepatAmine**
**Solution: Aminess, Aminosyn, Branch Amin, FreAmine III, NephrAmine, Novamine, ProcalAmine, Ren Amin, Travasol, TrophAmine**

*Func. class.:* Caloric agent
*Chem. class.:* Nitrogen product

**ACTION:** Needed for anabolism to maintain structure; decreases catabolism, promotes healing

**Therapeutic outcome:** Positive nitrogen balance, decreased catabolism

**USES:** Hepatic encephalopathy, cirrhosis, hepatitis, nutritional support in cancer, burn, or solid organ transplant patients; to prevent nitrogen loss when adequate nutrition by mouth, gastric, or duodenal tube cannot be used; intestinal obstruction, short bowel syndrome, severe malabsorption

## CONTRAINDICATIONS

Hypersensitivity, severe electrolyte imbalances, anuria, severe liver damage, maple syrup urine disease, PKU, azotemia, genetic disease of amino acid metabolism

**Precautions:** Pregnancy, children, renal disease, diabetes mellitus, HF, breastfeeding, sulfite sensitivity

## DOSAGE AND ROUTES

### Amino acid injection

**Adult: IV** 80-120 g/day; 500 ml of amino acids/500 ml $D_{50}$ given over 24 hr

### Amino acid solution

**Adult: IV** 1-1.5 g/kg/day titrated to patient's needs
**Child: IV** 2-3 g/kg/day titrated to patient's needs

**Available forms:** Inj; many strengths, types

### Implementation

**Continuous IV route**

- Give up to 40% protein and dextrose (up to 12.5%) via peripheral vein; stronger solutions require central **IV** administration; TPN only mixed with dextrose to promote protein synthesis
- Use immediately after mixing in pharmacy under strict aseptic technique using laminar flowhood; use infusion pump, in-line filter (0.22 μm) unless mixed with fat emulsion and dextrose (3 in 1)
- Use careful monitoring technique; do not speed up infusion; pulmonary edema, glucose overload will result
- Storage depends on type of solution; consult manufacturer
- Change dressing and **IV** tubing to prevent infection q24-48hr or q5-7days if transparent dressing is used

## ADVERSE EFFECTS

**CNS:** *Dizziness, headache,* confusion, loss of consciousness
**CV:** Hypertension, HF, pulmonary edema
**ENDO:** *Hyperglycemia, rebound hypoglycemia, electrolyte imbalances, hyperosmolar syndrome, hyperosmolar hyperglycemic nonketotic syndrome,* alkalosis, acidosis, hypophosphatemia, hyperammonemia, dehydration, hypocalcemia
**GI:** Nausea, vomiting, liver fat deposits, abdominal pain, jaundice, cholestasis
**GU:** Glycosuria, osmotic diuresis, diuresis
**INTEG:** Chills, flushing, warm feeling, rash, urticaria, extravasation necrosis, phlebitis at inj site

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete bioavailability |
| **Distribution** | Widely distributed |
| **Metabolism** | Anabolism |
| **Excretion** | Kidney to urea nitrogen |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Drug classifications

Tetracycline: decreased protein-sparing effects (inj only)

## NURSING CONSIDERATIONS

### Assessment

- Monitor electrolytes (potassium, sodium, calcium, chloride, magnesium), blood glucose, ammonia, phosphate, ketones; renal, liver function studies: BUN, creatinine, ALT, AST, bilirubin; urine glucose q6hr using Chemstrips, which are not affected by infusion substances; if BUN increases over 15%, therapy may need to be discontinued
- Check inj site for extravasation: redness along vein, edema at site, necrosis, pain; for a hard, tender area
- Monitor respiratory function q4hr: auscultate lung fields bilaterally for crackles; monitor respirations for quality, rate, rhythm that indicates fluid overload
- Monitor temp q4hr for increased fever, indicating infection; if infection is suspected, infusion is discontinued and tubing, bottle, catheter tip cultured; blood catheter may be obtained

• **Monitor for impending hepatic coma:** asterixis, confusion, fetor, lethargy
• **Hyperammonemia:** nausea, vomiting, malaise, tremors, anorexia, seizures; increased ammonia, ketone levels may occur

### Patient/family education

• Teach reason for use of amino acids as part of nutrition (TPN), how to care for tubing/site
• Instruct patient to report at once to prescriber if chills, sweating are experienced, risk of infection is higher

### Evaluation

**Positive therapeutic outcome**
• Weight gain
• Decreased jaundice in liver disorders
• Increased LOC

**⚠ HIGH ALERT**

## amiodarone (Rx)

(a-mee-oh'da-rone)
**Cordarone, Nexterone, Pacerone**
*Func. class.:* Antidysrhythmic (Class III)
*Chem. class.:* Iodinated benzofuran derivative

**Do not confuse:** amiodarone/amantadine

**ACTION:** Prolongs action potential duration and effective refractory period, noncompetitive α- and β-adrenergic inhibition; increases PR and QT intervals, decreases sinus rate, decreases peripheral vascular resistance

**Therapeutic outcome:** Decreased amount and severity of ventricular dysrhythmias

**USES:** Hemodynamically unstable ventricular tachycardia, supraventricular tachycardia, ventricular fibrillation not controlled by 1st-line agents

## CONTRAINDICATIONS

Pregnancy, breastfeeding, neonates, infants, severe sinus node dysfunction, hypersensitivity to this product/iodine/benzyl alcohol, cardiogenic shock

**BLACK BOX WARNING:** 2nd-3rd degree AV block, bradycardia

**Precautions:** Goiter, Hashimoto's thyroiditis, electrolyte imbalances, HF, severe respiratory disease, children, torsades de pointes

**BLACK BOX WARNING:** Cardiac arrhythmias, pneumonitis, pulmonary fibrosis, severe hepatic disease, requires a specialized setting

## DOSAGE AND ROUTES

### Prevention of recurrent life-threatening ventricular dysrhythmias

**Adult:** PO loading dose 800-1600 mg/day for 1-3 wk; then 600-800 mg/day × 1 mo; maintenance 400 mg/day; **IV** loading dose (first rapid) 150 mg over the first 10 min then slow 360 mg over the next 6 hr; maintenance 540 mg given over the remaining 18 hr, decrease rate of the slow infusion to 0.5 mg/min

**Available forms:** Tabs 100, 200, 400 mg; inj 50 mg/ml

### Implementation

Start with patient hospitalized and monitored
**PO route**
• Give reduced dosage slowly with ECG monitoring only
• Loading dose with food to decrease nausea

**IV, direct route**
• **Peripheral:** max 2 mg/ml for longer than 1 hr; preferred through central venous line with in-line filter; concentration >2 mg/ml should be given by central line
• **Cardiac arrest:** give 300 mg IV bol diluted to a total volume of 20 ml $D_5W$; may repeat 150 mg after 3-5 min
**Intermittent IV INF route**
• **Rapid loading:** add 3 ml (150 mg), 100 ml $D_5W$ (1.5 mg/ml), give over 10 min
• **Slow loading:** add 18 ml (900 mg), 500 ml $D_5W$ (1.8 mg/ml), give over next 6 hr
**Continuous IV infusion route**
• After 24 hr, dilute 50 ml to 1-6 mg/ml, give 1-6 mg/ml at 1 mg/ml for the first 6 hr, then 0.5 mg/min

**Y-site compatibilities:** Amikacin, bretylium, clindamycin, DOBUTamine, DOPamine, doxycycline, erythromycin, esmolol, gentamicin, insulin (regular), isoproterenol, labetalol, lidocaine, metaraminol, metroNIDAZOLE, midazolam, morphine, nitroglycerin, norepinephrine, penicillin G potassium, phentolamine, phenylephrine, potassium chloride, procainamide, tobramycin, vancomycin

**Solution compatibilities:** $D_5W$, 0.9% NaCl

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness,* involuntary movement, tremors, peripheral neuropathy, malaise, fatigue, ataxia, paresthesias, insomnia
**CV:** *Hypotension,* bradycardia, sinus arrest, HF, dysrhythmias, SA node dysfunction, AV block, increased defibrillation energy requirement
**EENT:** Blurred vision, halos, photophobia, *corneal microdeposits,* dry eyes

**ENDO:** Hyper/hypothyroidism
**GI:** Nausea, vomiting, diarrhea, abdominal pain, anorexia, constipation, hepatotoxicity
**GU:** Epididymitis, ED
**INTEG:** Rash, photosensitivity, blue-gray skin discoloration, alopecia, spontaneous ecchymosis, toxic epidermal necrolysis, urticaria, pancreatitis, phlebitis (IV)
**MISC:** Flushing, abnormal taste or smell, edema, abnormal salivation, coagulation abnormalities
**MS:** Weakness, pain in extremities
**RESP:** Pulmonary fibrosis/toxicity, pulmonary inflammation, ARDS, gasping syndrome in neonates

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Slow, variable (PO) up to 65% |
| **Distribution** | Body tissues; crosses placenta |
| **Metabolism** | Liver, an inhibitor of CYP1A2, CYP3A4, CYP2C8, CYP2C9, CYP2C19, CYP2A6, CYP2B6, CYP2D6, P-glycoprotein, organic cation transporter |
| **Excretion** | Bile, kidney (minimal) |
| **Half-life** | 15-100 days, increased in geriatrics |

### Pharmacodynamics

| | PO |
|---|---|
| **Onset** | 1-3 wk |
| **Peak** | 3-7 hr |
| **Duration** | Up to several months |

## INTERACTIONS

### Individual drugs

CycloSPORINE, dextromethorphan, digoxin, disopyramide, flecainide, methotrexate, phenytoin, procainamide, quiNIDine, theophylline: increased blood levels, increased toxicity
Loratadine, trazodone: Increased QT prolongation
Warfarin: increased bleeding, dabigatran

### Drug classifications

Azoles, fluoroquinolones, macrolides: increased QT prolongation
β-Adrenergic blockers, calcium channel blockers: increased bradycardia, sinus arrest, AV block
Class I antidysrhythmics: increased levels
HMG-CoA reductase inhibitors: increased myopathy
Protease inhibitors: increased amiodarone concentrations, possible serious dysrhythmias, reduce dose

### Drug/herb

St. John's wort: decreased amiodarone effect

### Drug/food

Grapefruit juice: toxicity

### Drug/lab test

Increased: $T_4$, ALT, AST, GGT, alk phos, cholesterol, lipids, PT, INR
Decrease: $T_3$

## NURSING CONSIDERATIONS

### Assessment

- Monitor electrolytes: potassium, sodium, chloride
- Monitor chest x-ray, thyroid function tests
- Monitor liver function studies: AST, ALT, bilirubin, alkaline phosphatase

**BLACK BOX WARNING: Cardiac dysrhythmias:** Monitor ECG continuously to determine product effectiveness; measure PR, QRS, QT intervals; check for PVCs, other dysrhythmias; monitor B/P continuously for hypo/hypertension; check for rebound hypertension after 1-2 hr

- Monitor for dehydration or hypovolemia, monitor PT, INR if using warfarin
- Assess for CNS symptoms: confusion, psychosis, numbness, depression, involuntary movements; if these occur, product should be discontinued
- Assess for hypothyroidism: lethargy, dizziness, constipation, enlarged thyroid gland, edema of extremities, cool, pale skin
- Monitor hyperthyroidism: restlessness, tachycardia, eyelid puffiness, weight loss, frequent urination, menstrual irregularities, dyspnea, warm, moist skin, may cause fatal thyrotoxicosis, cardiac dysrhythmias, product may need to be reduced or discontinued

**BLACK BOX WARNING:** Assess for pulmonary toxicity including ARDS, pulmonary fibrosis: dyspnea, fatigue, cough, fever, chest pain; product should be discontinued if these occur, increased at higher doses (400 mg/day), toxicity is common

- Monitor cardiac rate, respiration: rate, rhythm, character, chest pain, ventricular tachycardia, supraventricular tachycardia or fibrillation
- Assess sight and vision before treatment and throughout therapy; microdeposits on the cornea may cause blurred vision, halos, and photophobia, to prevent corneal deposits use methylcellulose
- Beers: Avoid as first-line therapy for atrial fibrillation in older adults unless heart failure

- Stevens-Johnson syndrome, toxic epidermal necrolysis; monitor for rash, blistering, discontinue immediately, notify prescriber
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

- Instruct patient to report side effects immediately to prescriber; more common at high dose NO
- Instruct patient that skin discoloration is usually reversible, but skin may turn bluish on neck, face, arms when used for long periods
- Advise patient that dark glasses may be needed for photophobia
- Instruct patient to use sunscreen and protective clothing to prevent burning associated with photosensitivity
- Instruct patient to take medication as prescribed, not to double doses, do not discontinue abruptly, not to use other drugs, herbs without prescriber approval, many interactions
- Instruct patient to complete follow-up appointment with health care provider, including pulmonary function studies, chest x-ray, ophthalmic examinations
- Teach patient to report vision changes, weight change, rash, blistering, numbness, temperature intolerance
- **Pregnancy/breastfeeding:** Teach patient product is not to be used during pregnancy or breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Decreased ventricular tachycardia
- Decreased supraventricular tachycardia or fibrillation

## TREATMENT OF OVERDOSE:

Administer $O_2$, artificial ventilation, ECG, DOPamine for circulatory depression, diazepam or thiopental for seizures, isoproterenol

## amitriptyline (Rx)

(a-mee-trip′ti-leen)

**Elavil, Levate, Novo-Triptyn**

*Func. class.:* Antidepressant—tricyclic

*Chem. class.:* Tertiary amine

**Do not confuse:** amitriptyline/nortriptyline/aminophylline

**ACTION:** Blocks reuptake of norepinephrine, serotonin into nerve endings that increase action of norepinephrine, serotonin in nerve cells

**Therapeutic outcome:** Decreased symptoms of depression after 2-3 wk

**USES:** Major depression

**Unlabeled uses:** Neuropathic pain, fibromyalgia

## CONTRAINDICATIONS

Hypersensitivity to tricyclics, recovery phase of MI

**Precautions:** Pregnancy, breastfeeding, geriatric, seizure disorders, prostatic hypertrophy, schizophrenia, psychosis, severe depression, increased intraocular pressure, closed-angle glaucoma, urinary retention, cardiac disease, renal/hepatic disease, hyperthyroidism, electroshock therapy, elective surgery

**BLACK BOX WARNING:** Child <12 yr, suicidal patients

## DOSAGE AND ROUTES

### For the treatment of major depression

**Adults:** PO Initially, 75 mg/day in divided doses or 50-100 mg qday at bedtime. Titrate if needed to 150 mg/day by increasing the daily dose 25-50 mg at weekly intervals

- **Geriatric:** PO 10-25 mg at bedtime initially. Titrate as needed and tolerated
- **Adolescents:** PO Begin at a low daily dosage, usually at bedtime, and titrate as needed and tolerated
- Children ≥ 9 yr (unlabeled) PO 1 mg/kg/day given in three divided doses, then increased after 3 days to 1.5 mg/kg/day

### For the treatment of social phobia (social anxiety disorder) or panic disorder (unlabeled)

**Adults:** PO 25 mg tid initially. Titrate up to 200 mg/day as tolerated or needed by increasing the daily dose 25-50 mg at weekly intervals

### For the treatment of postherpetic neuralgia (unlabeled)

**Adults:** PO A median dose of 75 mg/day PO at bedtime (range 25 mg/day to 137.5 mg/day) after titration has provided good-to-excellent responses; patients rated as having a poor response took a median dose of 50 mg/day PO at bedtime (range 25 mg/day to 125 mg/day)

### For the treatment of fibromyalgia (unlabeled)

**Adults:** PO In one trial, amitriptyline 10 mg PO once daily at bedtime and titrated up to 50 mg PO at bedtime was superior to placebo at 1 month but not significantly better at 3 or 6 months. In another small study comparing amitriptyline to FLUoxetine, placebo, or the combination of amitriptyline with FLUoxetine, amitriptyline 25 mg PO once daily alone was superior to placebo

### For the treatment of persistent singultus (hiccups) (unlabeled)
**Adults:** PO 10 mg PO tid

### For the treatment of primary nocturnal enuresis (unlabeled)
**Children and adolescents ≥11 yr:** PO 50 mg at bedtime
**Children 6 to 10 yr:** PO 25 mg at bedtime

### For the adjunct treatment of bulimia nervosa (unlabeled)
**Adults:** PO Initially, 25 mg PO tid. Titrate to 150 mg/day qday at bedtime by increasing the daily dose by 25 to 50 mg at weekly intervals, as tolerated or needed

### Therapeutic drug monitoring
The suggested therapeutic plasma concentration range for amitriptyline is 120-150 ng/ml. Plasma concentration monitoring should be considered in patients with an inadequate response or excessive adverse effects

**Available forms:** Tabs 10, 25, 50, 75, 100, 150 mg

### Implementation
- Give with food or milk for GI symptoms
- Crush if patient is unable to swallow medication whole
- Give dose at bedtime if oversedation occurs during day; may take entire dose at bedtime; geriatric may not tolerate once/day dosing
- Store at room temperature; do not freeze

## ADVERSE EFFECTS
**CNS:** *Dizziness, drowsiness,* confusion, headache, anxiety, tremors, stimulation, weakness, *insomnia,* nightmares, EPS (geriatric), increased psychiatric symptoms, seizures, suicidal thoughts, anxiety
**CV:** *Orthostatic hypotension,* ECG changes, tachycardia, hypertension, palpitations, dysrhythmias
**EENT:** *Blurred vision,* tinnitus, mydriasis, ophthalmoplegia, amblyopia
**GI:** *Constipation, dry mouth,* weight gain, nausea, vomiting, paralytic ileus, increased appetite, cramps, epigastric distress, jaundice, hepatitis, stomatitis
**GU:** *Urinary retention,* sexual dysfunction
**HEMA:** Agranulocytosis, thrombocytopenia, eosinophilia, leukopenia, aplastic anemia
**INTEG:** Rash, urticaria, sweating, pruritus, photosensitivity
**RESP:** Asthma exacerbation, rhinitis
**SYST:** Neuroleptic malignant syndrome, serotonin syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 10-46 hr |

### Pharmacodynamics

| | PO |
|---|---|
| **Onset** | 45 min |
| **Peak** | 2-12 hr |
| **Duration** | Unknown |

## INTERACTIONS
### Individual drugs
Alcohol: increased CNS depression
Amiodarone, procainamide, quiNIDine: increased QT prolongation
CarBAMazepine: increased amitriptyline levels, increased toxicity
Cimetidine, fluoxetine: increased levels, increased toxicity, may need dosage reduction
CloNIDine: decreased effects
Guanethidine: decreased effects
Linezolid, methylene blue: increased serotonin syndrome, use cautiously

### Drug classifications
Antidepressants, antidysrhythmics (class IC), phenothiazines: increased amitriptyline levels, toxicity
Antidysrhythmics (class IA, III), tricyclic antidepressants: increased QT prolongation
Antithyroid agents: increased risk of agranulocytosis
Barbiturates, benzodiazepines, CNS depressants, opioids, sedative/hypnotics, sympathomimetics (direct acting): increased CNS effects
MAOIs: hypertensive crisis, seizures, hyperpyretic crisis, do not use 14 days of MAOIs
Oral contraceptives: increased effects, toxicity
Sympathomimetics (indirect acting): decreased effects

### Drug/herb
Chamomile, hops, kava, lavender, valerian: increased CNS depression
SAM-e, St. John's wort, yohimbe: serotonin syndrome, avoid concurrent use

### Drug/lab test
Increased: serum bilirubin, blood glucose, alkaline phosphatase, LFTs
Decreased: WBCs, platelets, granulocytes, blood glucose

## NURSING CONSIDERATIONS

### Assessment

- Monitor B/P (with patient lying, standing), pulse q4hr; if systolic B/P drops 20 mm Hg, hold product, notify prescriber; take VS q4hr in patients with cardiovascular disease
- Monitor blood studies: CBC, leukocytes, differential, cardiac enzymes if patient is receiving long-term therapy, thyroid function tests
- Monitor hepatic studies: AST, ALT, bilirubin
- Check weight weekly; appetite may increase with product
- Assess ECG for flattening of T wave, bundle branch block, AV block, prolongation of QTc interval, dysrhythmias in cardiac patients, avoid use immediately after MI
- Assess for EPS primarily in geriatric: rigidity, dystonia, akathisia

**BLACK BOX WARNING:** Assess mental status: mood, sensorium, affect, suicidal tendencies; increase in psychiatric symptoms: depression, panic; suicidal tendencies are higher in those ≤ 24 yr, restrict amount of product available, not to use in child <12 yr

- **Assess for serotonin syndrome:** may occur with other serotonergic products (hyperthermia, hypertension, rigidity, delirium)
- Monitor urinary retention, constipation; constipation is more likely to occur in children or geriatric
- Assess for paralytic ileus, glaucoma exacerbation
- Assess for **withdrawal symptoms:** headache, nausea, vomiting, muscle pain, weakness; do not usually occur unless product was discontinued abruptly
- Identify alcohol consumption; if alcohol is consumed, hold dose until morning
- Assess for sexual dysfunction: erectile dysfunction, decreased libido; usually resolves after discontinuing product
- Beers: Avoid in older adults, highly anticholinergic, sedating, causes orthostatic hypotension
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, or if breastfeeding, use only if benefits clearly outweigh fetal risk

### Patient/family education

- Teach patient that therapeutic effects may take 2-3 wk, to take as directed, usually at bedtime, not to discontinue quickly after long-term use
- Instruct patient to use caution in driving or other activities requiring alertness because of drowsiness, dizziness, blurred vision; to avoid rising quickly from sitting to standing, especially geriatric; management of anticholinergic effects
- Teach patient the symptoms of serotonin syndrome, to report immediately fever, muscle twitching diarrhea, sweating, mental changes
- Advise patient to avoid alcohol ingestion, other CNS depressants; overheating
- Teach patient not to discontinue medication quickly after long-term use; may cause nausea, headache, malaise
- Advise patient to wear sunscreen or large hat, since photosensitivity occurs; hyperthermia can occur
- Teach patient to increase fluids, bulk in diet if constipation, urinary retention occur, especially geriatric
- Teach patient to use gum, hard sugarless candy, or frequent sips of water for dry mouth
- Instruct patient to use contraception during treatment

**BLACK BOX WARNING:** Teach patient to watch for suicidal ideation

### Evaluation

**Positive therapeutic outcome**

- Decreased depression
- Absence of suicidal thoughts

## TREATMENT OF OVERDOSE:

ECG monitoring, lavage, administer anticonvulsant, sodium bicarbonate

## amLODIPine (Rx)

(am-loe'di-peen)

**Norvasc**

*Func. class.:* Antianginal, calcium channel blocker, antihypertensive

*Chem. class.:* Dihydropyridine

**Do not confuse:** amLODIPine/aMILoride
Norvasc/Navane

**ACTION:** Inhibits calcium ion influx across cell membrane during cardiac depolarization; produces relaxation of coronary vascular smooth muscle and peripheral vascular smooth muscle; dilates coronary vascular arteries; increases myocardial oxygen delivery in patients with vasospastic angina

**Therapeutic outcome:** Decreased angina pectoris, dysrhythmias, B/P

**USES:** Chronic stable angina pectoris, hypertension, variant angina (Prinzmetal's angina); may coadminister with other antihypertensives, antianginals

## CONTRAINDICATIONS

Hypersensitivity to this product, severe aortic stenosis, severe obstructive CAD

**Precautions:** Pregnancy, breastfeeding, children, geriatric, HF, hypotension, hepatic injury, GERD

## DOSAGE AND ROUTES

### Coronary artery disease

**Adult:** PO 5-10 mg daily
**Geriatric:** PO 5 mg daily, may increase; max 10 mg/day

### Hypertension

**Adult:** PO 5 mg daily initially, max 10 mg/day
**Geriatric:** PO 2.5 mg/day; may increase to 5 mg/day, max 10 mg/day

### Hepatic dose

**Adult:** PO 2.5 mg/day, may increase to 10 mg/day (antihypertensive); 5 mg/day, may increase to 10 mg/day (antianginal)

**Available forms:** Tabs 2.5, 5, 10 mg

### Implementation

- Give once a day, without regard to meals

## ADVERSE EFFECTS

**CNS:** Headache, fatigue, dizziness, asthenia, anxiety, depression, insomnia, paresthesia, somnolence
**CV:** Peripheral edema, bradycardia, hypotension, palpitations, syncope, chest pain
**GI:** Nausea, vomiting, diarrhea, gastric upset, constipation, flatulence, anorexia, gingival hyperplasia, dyspepsia
**GU:** Nocturia, polyuria, sexual difficulties
**INTEG:** Rash, pruritus, urticaria, alopecia
**MISC:** Flushing, muscle cramps, cough, weight gain, tinnitus, epistaxis, pulmonary edema, dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed up to 90% |
| **Distribution** | Crosses placenta, protein binding 93% |
| **Metabolism** | Liver, extensively by CYP3A4 |
| **Excretion** | Kidneys to metabolites (90%) |
| **Half-life** | 30-50 hr; increased in geriatric, hepatic disease |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 6-10 hr |
| **Duration** | 24 hr |

## INTERACTIONS

### Individual drugs

Diltiazem: increased amLODIPine level; Conivapton; CYP3A4 inhibitors

### Drug classifications

Antihypertensives, nitrates: increased hypotension
Increase: level of cyclosporine
Increase: myopathy simvastatin

## NURSING CONSIDERATIONS

### Assessment

- Assess fluid volume status: distended red veins, crackles in lung; color, quality, and specific gravity of urine, skin turgor, adequacy of pulses, moist mucous membranes, bilateral lung sounds, peripheral pitting edema; dehydration symptoms of decreasing output, thirst, hypotension, dry mouth and mucous membranes should be reported
- Assess for angina: intensity, location, duration of pain
- Monitor B/P and pulse; if B/P drops, call prescriber
- Monitor ALT, AST, bilirubin daily; if these are elevated, hepatotoxicity is suspected
- Monitor platelet count: if $<150{,}000/mm^3$, product is usually discontinued and another product started
- Monitor cardiac status: B/P, pulse, respiration, ECG
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected or if breastfeeding, data are limited on pregnancy or breastfeeding

### Patient/family education

- Advise patient to avoid hazardous activities until stabilized on product, dizziness is no longer a problem
- Instruct patient to avoid alcohol and OTC products unless directed by prescriber
- Advise patient to comply in all areas of medical regimen: diet, exercise, stress reduction, smoking cessation, product therapy; to notify prescriber of irregular heartbeat, shortness of breath, swelling of feet, face, and hands, severe dizziness, constipation, nausea, hypotension; use nitroglycerin when angina is severe
- Teach patient to use as directed even if feeling better; may be taken with other cardiovascular products (nitrates, β-blockers)
- Advise to avoid large amounts of grapefruit juice or alcohol

### Evaluation

#### Positive therapeutic outcome

- Decreased anginal pain
- Decreased B/P
- Increased exercise tolerance

## TREATMENT OF OVERDOSE:

Defibrillation, β-agonists, **IV** calcium inotropic agents, diuretics, atropine for AV block, vasopressor for hypotension

## amoxicillin (Rx)

(a-mox-i-sill'in)

**Amoxil, Apo-Amoxi, Lin-Amox, Moxatag, Novamoxin, Nu-Amoxi**

*Func. class.:* Antiinfective, antiulcer

*Chem. class.:* Aminopenicillin

**ACTION:** Interferes with cell wall replication of susceptible organisms by binding to the bacterial cell wall; the cell wall; bactericidal, lysis mediated by bacterial cell wall autolysis

**Therapeutic outcome:** Bactericidal effects for the following organisms: effective for gram-positive cocci *(Staphylococcus aureus, Streptococcus pyogenes, Streptococcus faecalis, Streptococcus pneumoniae)*, gram-negative cocci *(Neisseria gonorrhoeae, Neisseria meningitidis)*, gram-negative bacilli *(Haemophilus influenzae, Proteus mirabilis, Escherichia coli, Salmonella)*, in combination for *Helicobacter pylori*, gram-positive bacilli *(Corynebacterium diphtheriae, Listeria monocytogenes)*; gastric ulcer, β-lactamase-negative organisms

**USES:** Infections of respiratory tract, skin, GI tract, GU tract, otitis media, meningitis, septicemia, sinusitis

**Unlabeled uses:** Lyme disease, anthrax treatment and prophylaxis, and bacterial endocarditis prophylaxis in combination with other products used for treatment of *Helicobacter pylori*

## CONTRAINDICATIONS

Hypersensitivity to penicillins

**Precautions:** Pregnancy, breastfeeding, neonates, hypersensitivity to cephalosporins, carbapenems; severe renal disease, mononucleosis, phenylketonuria, diabetes, geriatrics, asthma, child, colitis, dialysis, eczema, pseudomembranous colitis, syphilis

## DOSAGE AND ROUTES

### For the treatment of upper respiratory tract infections (pharyngitis, tonsillitis)

**Adults:** PO (immediate-release) 500 mg q1hr or 250 mg q8hr for mild/moderate infections and 875 mg q12hr or 500 mg q8hr for severe infections

**Infants >3 mo, children, and adolescents:** PO (immediate release) 20 mg/kg/day in divided doses every 8 hr (max: 250 mg/dose) or 25 mg/kg/day PO in divided doses every 12 hr (max: 500 mg/dose) for mild to moderate infections and 40 mg/kg/day PO in divided doses every 8 hr (max: 500 mg/dose) or 45 mg/kg/day PO in divided doses every 12 hr (max: 875 mg/dose) for severe infections

**Neonates and infants 3 mo and younger:** 30 mg/kg/day PO given in divided doses every 12 hr

### For the treatment of tonsillitis and/or pharyngitis (rheumatic fever prophylaxis) secondary to *Streptococcus pyogenes*

- Adults, adolescents, and children 12 yr and older PO (Moxatag 775-mg extended-release tablets) 775 mg qday, given within 1 hr of completing a meal, for 10 days

**Adults:** PO (immediate-release) 1 g qday or 500 mg bid for 10 days

- Infants, children, and adolescents PO (immediate-release) 25 mg/kg/dose (max: 500 mg/dose) bid for 10 days

### For the treatment of sinusitis

**Children and adolescents 2 yr and older (standard-dose therapy):** PO (immediate-release) 45 mg/kg/day divided q12hr

**Children and adolescents 2 yr and older (high-dose therapy):** PO (immediate-release) 80 to 90 mg/kg/day divided q12hr (max: 2 g/dose)

**Children younger than 2 yr:** PO Children younger than 2 yr should be treated with amoxicillin plus clavulanic acid, not amoxicillin alone

### For the treatment of acute otitis media

**Adults:** PO (immediate-release) 500 mg q12hr or 250 mg q8hr for mild/moderate infections and 875 mg q12hr or 500 mg q8hr for severe infections

- Infants ≥ 6 mo, children, and adolescents PO (immediate-release) 80 to 90 mg/kg/day divided q12hr
- Infants 4 to 5 mo PO (immediate-release) 80 to 90 mg/kg/day divided q12hr for 10 days
- Infants ≤ 3 mo PO (immediate-release) 30 mg/kg/day divided q12hr
- For the treatment of skin and skin structure infections (cellulitis):

### For mild to moderate infections caused by highly susceptible organisms

**Adults:** PO (immediate-release) 500 mg q12hr or 250 mg q8hr

**Infants > 3 mo, children, and adolescents:** PO (immediate-release) 20 mg/kg/day divided q8hr (max: 250 mg/dose) or 25 mg/kg/day divided q12hr (max: 500 mg/dose)

- Neonates and infants ≤ 3 mo PO (immediate-release) 30 mg/kg/day divided q12hr

### For severe infections or infections caused by less susceptible organisms

**Adults:** PO (immediate-release) 875 mg q12hr or 500 mg q8hr
**Infants > 3 mo, children, and adolescents:** PO (immediate-release) 40 mg/kg/day divided q8hr (max: 500 mg/dose) or 45 mg/kg/day divided q12hr (max: 875 mg/dose)
**Neonates and infants ≤ 3 mo:** PO (immediate-release) 30 mg/kg/day divided q12hr

### For the treatment of lower respiratory tract infections (e.g., pneumonia, community-acquired pneumonia, bronchitis)

**Adults:** PO (immediate-release) 875 mg q12hr or 500 mg q8hr
**Infants > 3 mo, children, and adolescents:** PO (immediate-release) 45 mg/kg/day divided q12hr or 40 mg/kg/day divided q8hr (max: 1750 mg/day)
**Neonates and infants ≤ 3 mo:** PO (immediate-release) 30 mg/kg/day divided q12hr
For the treatment of urinary tract infection (UTI) including cystitis

### For mild to moderate infections caused by highly susceptible organisms

**Adults:** PO (immediate-release) 500 mg q12hr or 250 mg q8hr
**Infants > 3 mo, children, and adolescents:** PO (immediate-release) 20 mg/kg/day divided q8hr (max: 250 mg/dose) or 25 mg/kg/day divided q12hr (max: 500 mg/dose)
**Neonates and infants ≤ 3 mo:** PO (immediate-release) 30 mg/kg/day divided q12hr

### For severe infections or infections caused by less susceptible organisms

**Adults:** PO (immediate-release) 875 mg q12hr or 500 mg q8hr
- Infants > 3 mo, children, and adolescents PO (immediate-release) 40 mg/kg/day divided q8hr (max: 500 mg/dose) or 45 mg/kg/day divided q12hr (max: 875 mg/dose)

**Neonates and infants ≤ 3 mo:** PO (immediate-release) 30 mg/kg/day divided q12hr

### Renal disease

**Adult:** PO CCr 10-30 ml/min 250-500 mg q12hr; CCr <10 ml/min 250-500 mg q24hr; do not use 775, 875 mg strength if CCr <30 ml/min

**Available forms:** Caps 250, 500 mg; chewable tabs 125, 200, 250, 400 mg; tabs 250, 500, 875 mg; ext rel tab (Moxatag) 775 mg; susp 125, 200, 250, 400 mg/5 ml

## Implementation

### PO route

- Identify allergies before use
- Give in even doses around the clock without regard to food; if GI upset occurs, give with food; product must be given for 10-14 days to ensure organism death and prevent superinfection; store in tight container
- The caps may be opened and contents taken with fluids
- **Suspension:** shake well before each dose, may be used alone or mixed in drinks, use immediately; susp may be stored in refrigerator for 14 days
- **Extended release:** do not crush, chew, or break; take with food

## ADVERSE EFFECTS

**CNS:** Headache, seizures, agitation, confusion, dizziness, insomnia
**GI:** *Nausea, vomiting, diarrhea,* increased AST, ALT, abdominal pain, glossitis, colitis, pseudomembranous colitis, jaundice, cholestasis
**HEMA:** Anemia, increased bleeding time, bone marrow depression, granulocytopenia, hemolytic anemia, eosinophilia, thrombocytopenia, agranulocytosis
**INTEG:** *Urticaria, rash*
**SYST:** Anaphylaxis, respiratory distress, serum sickness, Stevens-Johnson syndrome, toxic epidermal necrolysis, exfoliative dermatitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (90%) |
| **Distribution** | Readily in body tissues, fluids, CSF; crosses placenta |
| **Metabolism** | Liver (30%) |
| **Excretion** | Breast milk, kidney, unchanged (70%) |
| **Half-life** | 1-1.3 hr, extended in renal disease |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ½ hr |
| **Peak** | 1-2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Methotrexate: increased methotrexate levels, monitor for toxicity
Probenecid: increased amoxicillin levels, decreased renal excretion, used for this reason
Warfarin: increased anticoagulant effects

### Drug classifications

Contraceptives (hormonal): may decrease contraceptive effectiveness

### Drug/lab test

Decreased: Hgb, WBC, platelets
Increase: AST/ALT, alk phos, LDH, eosinophils
Interference: urine glucose test (Clinitest, Benedict's reagent, cupric $SO_4$)

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for previous sensitivity reaction to penicillins or other cephalosporins; cross-sensitivity between penicillin products and cephalosporins is common
- Assess patient for signs and symptoms of **infection**, including characteristics of wounds, sputum, urine, stool, WBC >10,000/$mm^3$, earache, fever; obtain baseline information and monitor symptoms during treatment
- Obtain C&S before beginning product therapy to identify if correct treatment has been initiated
- **Assess for allergic reactions during treatment:** rash, urticaria, pruritus, chills, fever, joint pain; angioedema may occur a few days after therapy begins; EPINEPHrine and resuscitation equipment should be available for anaphylactic reactions, rash is more common if allopurinol is taken concurrently
- Identify urine output; if decreasing, notify prescriber (may indicate nephrotoxicity); also, increased BUN, creatinine, urinalysis, protein, blood
- Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test baseline and monthly if patient is on long-term therapy
- Monitor electrolytes: potassium, sodium, chloride monthly if patient is on long-term therapy
- Assess bowel pattern daily; diarrhea, cramping, blood in stools; if severe diarrhea occurs, notify prescriber; product should be discontinued; pseudomembranous colitis may occur
- Monitor for bleeding: ecchymosis, bleeding gums, hematuria, stool guaiac daily if on long-term therapy
- Assess for overgrowth of infection: perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum
- Pregnancy/breastfeeding: Identify if pregnancy is planned or suspected, or if breastfeeding, usually considered safe in pregnancy, use cautiously in breastfeeding

### Patient/family education

- Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
- Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, diarrhea, sore throat, fever, fatigue, furry tongue occur; may indicate superinfection or agranulocytopenia
- Instruct patient to take all medication prescribed for the length of time ordered; not to double dose; chew form is available
- Advise patient to notify prescriber of diarrhea with blood or pus, abdominal pain, which may indicate pseudomembranous colitis

### Evaluation

**Positive therapeutic outcome**

- Absence of signs/symptoms of infection (WBC <10,000/$mm^3$, temp WNL, absence of red draining wounds or earache)
- Prevention of endocarditis
- Resolution of ulcer symptoms

## TREATMENT OF ANAPHYLAXIS:

Withdraw product, maintain airway, administer EPINEPHrine, aminophylline, $O_2$, **IV** corticosteroids

## amoxicillin/clavulanate (Rx)

(a-mox-i-sill'in)
**Apo-Amoxi Clav ✱, Augmentin, Augmentin ES, Augmentin XR, Clavulin ✱**
*Func. class.:* Broad-spectrum antiinfective (extended spectrum)
*Chem. class.:* Aminopenicillin-β-lactamase inhibitor

**ACTION:** Interferes with cell wall replication of susceptible organisms; lysis mediated by bacterial cell wall autolytic enzymes, combination increases spectrum of activity against β-lactamase resistance organisms

**Therapeutic outcome:** Bactericidal effects for *Actinomyces, Bacillus anthracis, Bacteroides, Bordetella pertussis, Borrelia burgdorferi, Brucella, Burkholderia pseudomallei, Clostridium perfringens, Clostridium tetani, Corynebacterium diphtheriae, Eikenella corrodens, Enterobacter, Enterococcus faecalis, Erysipelothrix rhusiopathiae, Escherichia coli, Eubacterium, Fusobacterium, Haemophilus ducreyi, Haemophilus parainfluenzae* (positive/negative beta-lactamase), *Helicobacter pylori, Klebsiella, Lactobacillus, Listeria monocytogenes, Moraxella catarrhalis, Neisseria gonorrhoeae, Neisseria meningitis, Nocardia brasiliensis, Peptococcus, Peptostreptococcus, Prevotella melaninogenica, Propionibacterium, Salmonella, Shigella, Staphylococcus*

*aureus* (MSSA), *Staphylococcus epidermidis, Staphylococcus saprophyticus, Streptococcus agalactiae* (group B Streptococci), *Streptococcus dysgalactiae, Streptococcus pneumoniae, Streptococcus pyogenes* (group A Streptococci), *Treponema pallidium, Vibrio cholerae,* viridans streptococci

**USES:** Infections of lower respiratory tract, skin, GU tract; impetigo; otitis media, sinusitis, pneumonia, and endocarditis prophylaxis

## CONTRAINDICATIONS

Hypersensitivity to penicillins, severe renal disease, dialysis, jaundice

**Precautions:** Pregnancy, breastfeeding, neonates, children, hypersensitivity to cephalosporins, GI/renal disease, asthma, colitis, diabetes, eczema, leukemia, mononucleosis, viral infections, phenylketonuria

## DOSAGE AND ROUTES

### Recurrent/persistent otitis media *(Streptococcus pneumoniae, Haemophilus influenzaem, Moreaxella catarrhalis)* in those exposed to antiinfectives within the past 3 mo (≤ 2 yr or in daycare)

**Child >3 mo** PO 90 mg/kg/day (600 mg amoxicillin/42.9mg clavulanate) q12hr × 10 days

### Lower respiratory infections, otitis media, sinusitis, skin/skin structure infections; UTIs (gram positive/negative)

**Adult:** PO 250-500 mg q8hr or 500-875 mg q12hr depending on severity of infection
**Child ≤40 kg:** PO 20-90 mg/kg/day in divided doses q8-12hr

### Community-acquired pneumonia or acute bacterial sinusitis

**Adult:** PO 2000 mg/125 mg (Augumentin XR) q12hr x 7-10 days (pneumonia), 10 days (sinusitis)

### Renal dose

**Adult:** PO CCr 10-30 ml/min dose q12hr; CCr <10 ml/min dose q24hr; do not use 875 mg strength if CCr <30 ml/min; Augmentin XR is contraindicated in renal disease

**Available forms:** Tabs 250, 500, 875 mg amoxicillin/125 mg clavulanate; chewable tabs 200/28.5, 400/57 mg; powder for oral susp 125, 250/28.5, 200/28.5, 400/57, 600/42.9 mg/5 ml; (XR) ext rel tabs 1000 mg amoxicillin/62.5 mg clavulanate; (ES) powder for oral susp 600 mg amoxicillin; 42.9 mg clavulanate 5 ml

## Implementation

### PO route

- Give in even doses around the clock; if GI upset occurs, give with food; product must be taken for 10-14 days to ensure organism death and prevent superinfection; store in tight container; cap can be opened and mixed with food or liquid; chewable tabs should be chewed
- Administer only as directed; two 250-mg tabs not equivalent to one 500-mg tab due to strength of clavulanate
- Shake susp well before each dose; may be used alone or mixed in drinks, use immediately; susp may be stored in refrigerator for 10 days

## ADVERSE EFFECTS

**CNS:** Headache, fever, seizures, agitation, insomnia
**GI:** *Nausea, diarrhea, vomiting,* increased AST, ALT, abdominal pain, glossitis, colitis, black tongue, pseudomembranous colitis, jaundice
**GU:** Oliguria, proteinuria, hematuria, *vaginitis, moniliasis,* glomerulonephritis
**HEMA:** Anemia, bone marrow depression, granulocytopenia, leukopenia, eosinophilia, thrombocytopenic purpura
**INTEG:** Rash, urticaria, dermatitis, toxic epidermal necrolysis
**META:** Hyperkalemia, hypokalemia, alkalosis, hypernatremia
**SYST:** Anaphylaxis, respiratory distress, serum sickness, superinfection, Stevens-Johnson syndrome , superinfection, candidiasis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (90%) |
| **Distribution** | Readily in body tissues, fluids, CSF; crosses placenta |
| **Metabolism** | Liver (30%) |
| **Excretion** | Breast milk; kidney, unchanged (70%), removed by hemodialysis |
| **Half-life** | 1-1.3 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ½ hr |
| **Peak** | 1-2.5 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Allopurinol: increased skin rash
Probenecid: increased amoxicillin levels, used for this reason
Warfarin: increased anticoagulant effect, monitor closely: dose adjustment may be needed

### Drug/food
High-fat meal: decreased absorption

### Drug/lab test
Increased: AST/ALT, alk phos, LDH
Interference: urine glucose tests (Clinitest, Benedict's reagent, cupric $SO_4$)

## NURSING CONSIDERATIONS
### Assessment
- Assess patient for previous sensitivity reaction to penicillins or other cephalosporins; cross-sensitivity between penicillins and cephalosporins is common
- Assess patient for signs and symptoms of **infection**, including characteristics of wounds, sputum, urine, stool, WBC >10,000/$mm^3$, earache, fever; obtain baseline information and during treatment
- Complete C&S before beginning product therapy to identify if correct treatment has been initiated
- **Assess for anaphylaxis:** rash, urticaria, pruritus, chills, dyspnea, laryngeal edema, fever, joint pain; angioedema may occur a few days after therapy begins; EPINEPHrine and resuscitation equipment should be available for anaphylactic reaction
- Identify urine output; if decreasing, notify prescriber (may indicate nephrotoxicity)
- Monitor renal studies: urinalysis, protein, blood, BUN, creatinine
- Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test baseline and monthly if patient is on long-term therapy
- Monitor electrolytes: potassium, sodium, chloride monthly if patient is on long-term therapy
- Assess bowel pattern daily; diarrhea, cramping, blood in stools, report to prescriber; if severe diarrhea occurs, product should be discontinued; may indicate pseudomembranous colitis
- Monitor for bleeding: ecchymosis, bleeding gums, hematuria, stool guaiac daily if on long-term therapy
- Assess for **overgrowth of infection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum
- Pregnancy/baseline: Use only if clearly needed, cautious use in breastfeeding, excreted in breast milk

### Patient/family education
- Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
- Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools occur; may indicate superinfection
- Instruct patient to take all medication prescribed for the length of time prescribed
- Advise patient to notify prescriber of diarrhea with blood or pus, which may indicate pseudomembranous colitis

### Evaluation
**Positive therapeutic outcome**
- Absence of signs/symptoms of infection (WBC <10,000/$mm^3$, temp WNL)
- Reported improvement in symptoms of infection

## TREATMENT OF ANAPHYLAXIS:
Withdraw product, maintain airway, administer EPINEPHrine, aminophylline, $O_2$, **IV** corticosteroids

**⚠ HIGH ALERT**

## amphotericin B lipid complex (ABLC)
(am-foe-ter'i-sin)
**Abelcet**
*Func. class.:* Antifungal
*Chem. class.:* Amphoteric polyene

**Do not confuse:** Abelcet/amphotericin B

**ACTION:** Increases cell membrane permeability in susceptible fungi by binding sterols; alters cell membrane, thereby causing leakage of cell components, cell death

**Therapeutic outcome:** Decreased fever, malaise, rash; negative C&S for infecting organism

**USES:** Indicated for the treatment of invasive fungal infections in patients who cannot tolerate or have failed conventional amphotericin B therapy; broad-spectrum activity against many fungal, yeast and mold pathogen infections, including *Aspergillus, Zygomycetes, Fusarium, Cryptococcus,* and many hard-to-treat *Candida* species; *Aspergillus fumigatus, Aspergillus, Blastomyces dermatitidis, Candida albicans, Candida guilliermondii, Candida stellatoidea, Candida tropicalis, Coccidioides immitis, Cryptococcus, Histoplasma, sporotrichosis*

**Precautions:** Hypersensitivity, anemia, breastfeeding, cardiac disease, children, electrolyte imbalance, geriatric, hematological/hepatic/renal disease, hypotension, pregnancy

## DOSAGE AND ROUTES
**Adult: IV** 3-5 mg/kg/day as a single inf given at 2.5 mg/kg/hr

### Renal dose
**Adult:** IV CCr <10 ml/min; give 5 mg/kg q24-36hr

**Available forms:** Susp for inj 100 mg/20-ml vial

## Implementation

- Do not confuse four different types; these are not interchangeable: conventional amphotericin B, amphotericin B cholesteryl, amphotericin B lipid complex, amphotericin B liposome
- May premedicate with acetaminophen, diphenhydrAMINE
- Use only after C&S confirms organism

### IV route

- Give product only after C&S confirms organism, product needed to treat condition; make sure product is used for life-threatening infections
- Handle with aseptic technique because amphotericin B lipid complex (ABLC) has no preservatives; visually inspect parenteral products for particulate matter and discoloration before use

**Filtration and dilution**

- Prior to dilution, store at 36°-46° F (2°-8° C), protected from moisture and light; do not freeze; the diluted, ready-for-use admixture is stable for up to 48 hours at 36°-46° F (2°-8° C) and an additional 6 hr at room temperature; do not freeze
- Prepare the admixture for infusion by first shaking the vial until there is no evidence of yellow sediment on the bottom of the vial
- Transfer the appropriate amount of drug from the required number of vials into one or more sterile syringes using an 18-gauge needle
- Attach the provided 5-micron filter needle to the syringe; inject the syringe contents through the filter needle, into an IV bag containing the appropriate amount of $D_5W$ injection; each filter needle may be used on the contents of no more than four 100-mg vials
- The suspension must be diluted with $D_5W$ injection to a final concentration of 1 mg/ml; for pediatric patients and patients with cardiovascular disease, the final concentration may be 2 mg/ml; DO NOT USE SALINE SOLUTIONS OR MIX WITH OTHER DRUGS OR ELECTROLYTES
- The diluted ready-for-use admixture is stable for up to 48 hr at 36°-46° F (2°-8° C) and an additional 6 hr at room temperature; do not freeze

**IV INF**

- Flush IV line with $D_5W$ injection before use or use a separate IV line; DO NOT USE AN IN-LINE FILTER
- Before infusion, shake the bag until the contents are thoroughly mixed; max rate 2.5 mg/kg/hr; if the infusion time exceeds 2 hr, mix the contents by shaking the infusion bag every 2 hr

**Y-site compatibilities:** Acyclovir, allopurinol, aminocaproic acid, aminophylline, amiodarone, anidulafungin, argatroban, arsenic trioxide, atracurium, azithromycin, aztreonam, bumetanide, buprenorphine, busulfan, butorphanol, CARBOplatin, carmustine, ceFAZolin, cefepime, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, cisatracurium, clindamycin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin dexamethasone, digoxin, diphenhydrAMINE, DOCEtaxel, doxacurium, DOXOrubicin liposomal, enalaprilat, EPINEPHrine, eptifibatide, ertapenem, etoposide, famotidine, fentaNYL, fludarabine, fluorouracil, fosphenytoin, furosemide, ganciclovir, granisetron, heparin, hydrocortisone, HYDROmorphone, ifosfamide, insulin, regular ketorolac, lepirudin, lidocaine, linezolid, LORazepam, mannitol, melphalan, meperidine, methotrexate, methylPREDNISolone, metoclopramide, mitoMYcin, mivacurium, nafcillin, nesiritide, nitroglycerin, nitroprusside, octreotide, oxaliplatin, PACLitaxel, pamidronate, pantoprazole, PEMEtrexed, pentazocine, PENTobarbital, PHENobarbital, phentolamine, piperacillin-tazobactam, procainamide, ranitidine, succinylcholine, SUFentanil, tacrolimus, telavancin, teniposide, theophylline, thiopental, thiotepa, ticarcillin, ticaracillin-clavulanate, trimethobenzamide, verapamil, vinBLAStine, vinCRIStine, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CNS:** *Headache, fever, chills,* peripheral nerve pain, paresthesias, peripheral neuropathy, seizures, dizziness

**CV:** Bradycardia, hypotension, cardiac arrest, chest pain, hypertension

**EENT:** Tinnitus, deafness, diplopia, blurred vision

**GI:** *Nausea, vomiting, anorexia,* diarrhea, cramps, hemorrhagic gastroenteritis, acute liver failure, jaundice, bilirubinemia

**GU:** *Hypokalemia,* azotemia, hyposthenuria, renal tubular acidosis, nephrocalcinosis, permanent renal impairment, anuria, oliguria

**HEMA:** Normochromic, normocytic anemia, thrombocytopenia, agranulocytosis, leukopenia, eosinophilia

**INTEG:** *Burning, irritation,* pain, necrosis at inj site with extravasation, flushing, dermatitis

**META:** Hyponatremia, hypomagnesemia, hypokalemia

**MS:** Arthralgia, myalgia, generalized pain, weakness, weight loss

**RESP:** Bronchospasm, dyspnea

**SYST:** Toxic epidermal neurolysis, exfoliative dermatitis, anaphylaxis, sepsis, infection, infusion reactions

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete bioavailability (IV) |
| **Distribution** | Body tissues |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, detectable for several weeks |
| **Half-life** | Terminal lipid complex mean 7 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Immediate |
| **Peak** | 2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Cidofovir: do not use concurrently
Digoxin: increased hypokalemia
Pentamidine, tacrolimus, tenofovir: increased nephrotoxicity

### Drug classifications

Other nephrotoxic antibiotics (aminoglycosides, CISplatin, vancomycin, cycloSPORINE, polymyxin B), antineoplastics, salicylates): increased nephrotoxicity
Azole antifungals: decreased amphotericin B lipid complex effect; antifungals may still be used concurrently in serious resistant infections
Corticosteroids, skeletal muscle relaxants, thiazides, loop diuretics: increased hypokalemia, monitor electrolytes

### Drug/lab test

Increased: AST/ALT, alk phos, BUN, creatinine, LDH, bilirubin
Decreased: magnesium, potassium, Hgb, WBC, platelets

## NURSING CONSIDERATIONS

### Assessment

- VS every 15-30 min during first inf; note changes in pulse, B/P
- I&O ratio; watch for decreasing urinary output, change in specific gravity; discontinue product to prevent permanent damage to renal tubules
- Blood studies: CBC, potassium, sodium, calcium, magnesium every 2 wk; BUN, creatinine 2-3 ×/wk
- Weight weekly; if weight increases by more than 2 lb/wk, edema is present; renal damage should be considered
- **For renal toxicity:** increasing BUN, serum creatinine; if BUN is >40 mg/dl or if serum creatinine is >3 mg/dl, product may be discontinued, dosage reduced
- **For hepatotoxicity:** increasing AST, ALT, alk phos, bilirubin
- **For allergic reaction:** dermatitis, rash; product should be discontinued, antihistamines (mild reaction) or EPINEPHrine (severe reaction) should be administered
- For hypokalemia: anorexia, drowsiness, weakness, decreased reflexes, dizziness, increased urinary output, increased thirst, paresthesias
- Infusion reactions: fever, chills, pain, swelling at site
- For ototoxicity: tinnitus (ringing, roaring in ears), vertigo, loss of hearing (rare)
- Pregnancy/breastfeeding: Use only when clearly needed

### Patient/family education

- Teach patient that long-term therapy may be needed to clear infection (2 wk-3 mo, depending on type of infection)
- Instruct patient to notify prescriber of bleeding, bruising, or soft-tissue swelling, neurologic, renal symptoms
- Pregnancy/breastfeeding: Advise patient to notify provider if pregnancy is planned or suspected, not to breastfeed

### Evaluation

**Positive therapeutic outcome**

- Decreased fever, malaise, rash; negative C&S for infecting organism

**⚠ HIGH ALERT**

## amphotericin B liposomal (LAmB)

(am-foe-ter'i-sin)
**AmBisome**
*Func. class.:* Antifungal
*Chem. class.:* Amphoteric polyene

**Do not confuse:** AmBisome/amphotericin B

**ACTION:** Increases cell membrane permeability in susceptible fungi by binding to membrane sterols; alters cell membrane, thereby causing leakage of cell components, cell death

**Therapeutic outcome:** Resolution of infection

**USES:** Empirical therapy for presumed fungal infection in febrile neutropenic patients; treatment of *Cryptococcal* Meningitis in HIV-infected patients; treatment of *Aspergillus, Candida,* and/or *Cryptococcus* infections refractory to amphotericin B deoxycholate, or in patients where renal impairment or unacceptable toxicity precludes the use of amphotericin B deoxycholate *(Aspergillus flavus, Aspergillus fumigatus, Blastomyces dermatitidis, Candida albicans, Candida krusei,*

*Candida lusitaniae, Candida parapsilosis, Candida tropicalis, Cryptococcus neoformans)*; treatment of visceral leishmaniasis

**Unlabeled uses:** Coccidioidomycosis, histoplasmosis

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Anemia, breastfeeding, cardiac disease, children, electrolyte imbalance, geriatric, hematological/hepatic/renal disease, hypotension, pregnancy, severe bone marrow depression

## DOSAGE AND ROUTES

### Systemic fungal infections caused by *Aspergillus* sp., *Candida* sp., *Cryptococcus sp.* refractory to or intolerant of amphotericin B deoxycholate treatment

**Adults and children:** IV 3 to 5 mg/kg/dose q24hr, treatment time depends on condition

### For the treatment of esophageal candidiasis (unlabeled) in HIV-infected patients

**Adults/adolescents:** IV 3 to 4 mg/kg/dose q24hr for 14 to 21 days

### For the treatment of cryptococcal meningitis in HIV-infected patients

**Adults/adolescents/children/infants:** IV 6 mg/kg/dose q24hr

### For the treatment of severe disseminated (nonmeningeal) or diffuse pulmonary coccidioidomycosis (unlabeled) in HIV-infected patients

**Adults:** IV 3 to 5 mg/kg/dose q24hr

### Renal dose

**Adult:** IV CCr <10 ml/min; use 3 mg/kg q24hr

**Available forms:** Powder for inj 50-mg vial

### Implementation

- Do not confuse four different types; these are not interchangeable: conventional amphotericin B, amphotericin B cholesteryl, amphotericin B lipid complex, amphotericin B liposome
- May premedicate with acetaminophen, diphenhydrAMINE

**IV route**

- Make sure product is used for life-threatening infections
- Administer by IV infusion only; handle with aseptic technique as LAmB does not contain any preservatives
- Visually inspect products for particulate matter and discoloration

**Reconstitution**

- LAmB *must* be reconstituted using sterile water for injection (without a bacteriostatic agent); do not reconstitute with saline or add saline to the reconstituted suspension, do not mix with other drugs; doing so can cause a precipitate to form
- Reconstitute vials containing 50 mg of LAmB/12 ml of sterile water (4 mg/ml)
- Immediately after the addition of water, SHAKE THE VIAL VIGOROUSLY for 30 sec; the suspension should be yellow and translucent; visually inspect vial for particulate matter and continue shaking until product is completely dispersed
- Store suspension for up to 24 hours refrigerated if using sterile water for injection; do not freeze

**Filtration and dilution**

- Calculate the amount of reconstituted (4 mg/ml) suspension to be further diluted and withdraw this amount into a sterile syringe
- Attach the provided 5-micron filter to the syringe; inject the syringe contents through the filter, into the appropriate amount of $D_5W$ injection; use only one filter per vial
- The suspension must be diluted with $D_5W$ injection to a final concentration of 1-2 mg/ml before administration; for infants and small children, lower concentrations (0.2-0.5 mg/ml) may be appropriate to provide sufficient volume for infusion
- Use injection of LAmB within 6 hr of dilution with $D_5W$

**IV INF**

- Flush intravenous line with $D_5W$ injection before infusion; if this cannot be done, then a separate IV line must be used
- An inline membrane filter may be used provided the mean pore diameter of the filter is not less than 1 micron
- Administer by IV infusion using a controlled infusion device over a period of approximately 120 min; infusion time may be reduced to approximately 60 min in patients who tolerate the infusion; if discomfort occurs during infusion, the duration of infusion may be increased

**Acetaminophen and diphenhydrAMINE**

- 30 min before inf to reduce fever, chills, headache
- Store protected from moisture and light; diluted solution is stable for 24 hr at room temp

**Y-site compatibilities:** Acyclovir, amifostine, aminophylline, anidulafungin, atropine, azithromycin, bivalirudin, bumetanide, buprenorphine, busulfan, butorphanol, CARBOplatin, carmustine, ceFAZolin, ceFOXitin, ceftizoxime, ceftRIAXone,

cefuroxime, cimetidine, clindamycin, cyclophosphamide, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, diphenhydrAMINE, doxacurium, enalaprilat, ePHEDrine, EPINEPHrine, eptifibatide, ertapenem, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, fludarabine, fluorouracil, fosphenytoin, furosemide, granisetron, haloperidol, heparin, hydrocortisone, HYDROmorphone, ifosfamide, isoproterenol, ketorolac, levorphanol, lidocaine, linezolid, mesna, methotrexate, methylPREDNISolone, metoprolol, milrinone, mitoMYcin, nesiritide, nitroglycerin, nitroprusside, octreotide, oxaliplatin, oxytocin, palonosetron, pancuronium, pantoprazole, PEMEtrexed, PENTobarbital, PHENobarbital, phenylephrine, piperacillin/tazobactam, potassium chloride, procainamide, ranitidine, SUFentanil, tacrolimus, theophylline, thiopental, thiotepa, ticarcillin/clavulanate, tigecycline, trimethoprim-sulfamethoxazole, vasopressin, vinCRIStine, voriconazole, zidovudine

## ADVERSE EFFECTS

**CNS:** *Headache, fever, chills,* peripheral nerve pain, paresthesias, peripheral neuropathy, seizures, dizziness, insomnia

**CV:** Bradycardia, hypotension, cardiac arrest

**EENT:** Tinnitus, deafness, diplopia, blurred vision

**ENDO:** Hyperglycemia

**GI:** *Nausea, vomiting, anorexia,* diarrhea, cramps, hemorrhagic gastroenteritis, acute liver failure

**GU:** *Hypokalemia,* azotemia, hyposthenuria, renal tubular acidosis, nephrocalcinosis, permanent renal impairment, anuria, oliguria

**HEMA:** Normochromic normocytic anemia, thrombocytopenia, agranulocytosis, leukopenia, eosinophilia, hyponatremia, hypomagnesemia

**INTEG:** *Burning, irritation,* pain, necrosis at inj site with extravasation, flushing, dermatitis, skin rash (topical route)

**MS:** Arthralgia, myalgia, generalized pain, weakness, weight loss

**RESP:** Dyspnea

**SYST:** Stevens–Johnson syndrome, toxic epidermal neurolysis, exfoliative dermatitis, anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete bioavailability (IV) |
| **Distribution** | Body tissues |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, detectable for several weeks |
| **Half-life** | Liposomal mean 4-6 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Immediate |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Digoxin: increased hypokalemia

### Drug classifications

Other nephrotoxic antibiotics (aminoglycosides, CISplatin, vancomycin, cycloSPORINE, polymyxin B): increased nephrotoxicity

Corticosteroids, skeletal muscle relaxants, thiazides: increased hypokalemia

## NURSING CONSIDERATIONS

### Assessment

- VS every 15-30 min during first inf; note changes in pulse, B/P
- I&O ratio; watch for decreasing urinary output, change in specific gravity; discontinue product to prevent permanent damage to renal tubules
- Blood studies: CBC, potassium, sodium, calcium, magnesium every 2 wk, BUN, creatinine 2-3 ×/wk
- Weight weekly; if weight increases by more than 2 lb/wk, edema is present; renal damage should be considered
- **For renal toxicity:** increasing BUN, serum creatinine; if BUN is >40 mg/dl or if serum creatinine is >3 mg/dl, product may be discontinued, dosage reduced
- **For hepatotoxicity:** increasing AST, ALT, alk phos, bilirubin, monitor LFTs
- **For allergic reaction:** dermatitis, rash; product should be discontinued, antihistamines (mild reaction) or EPINEPHrine (severe reaction) administered
- **For hypokalemia:** anorexia, drowsiness, weakness, decreased reflexes, dizziness, increased urinary output, increased thirst, paresthesias
- **For ototoxicity:** tinnitus (ringing, roaring in ears), vertigo, loss of hearing (rare)
- **Infusion reaction:** chills, fever, pain, swelling at site
- **Pregnancy/breastfeeding:** Use only if clearly needed, do not breastfeed, excretion unknown

### Patient/family education

- Teach patient that long-term therapy may be needed to clear infection (2 wk-3 mo, depending on type of infection)
- Instruct patient to notify prescriber of bleeding, bruising, or soft-tissue swelling, renal, neurological side effects

## Evaluation

**Positive therapeutic outcome**

• Decreased fever, malaise, rash; negative C&S for infecting organism

## ampicillin (Rx)

(am-pi-sill′in)

**Ampicin, Apo-Ampi, Nu-Ampi, Penbritin**

*Func. class.:* Broad-spectrum antiinfective

*Chem. class.:* Aminopenicillin

**ACTION:** Interferes with cell wall replication of susceptible organisms; the cell wall, rendered osmotically unstable, swells and bursts from osmotic pressure, lysis mediated by cell wall autolysis

**Therapeutic outcome:** Bactericidal effects for the following organisms: effective for gram-positive cocci *(Streptococcus aureus, Streptococcus pyogenes, Streptococcus faecalis, Streptococcus pneumoniae)*, gram-negative cocci *(Neisseria meningitidis)*, gram-negative bacilli *(Haemophilus influenzae, Proteus mirabilis, Salmonella, Shigella, Listeria monocytogenes)*, gram-positive bacilli

**USES:** Infections of respiratory tract, skin, skin structures, GI/GU tract; otitis media, meningitis, septicemia, sinusitis, and endocarditis prophylaxis, bacterial endocarditis

## CONTRAINDICATIONS

Hypersensitivity to penicillins, antimicrobial resistance, skin infection

**Precautions:** Pregnancy, breastfeeding, neonates, hypersensitivity to cephalosporins, renal disease, mononucleosis

## DOSAGE AND ROUTES

### Renal dose

**Adult and child:** CCr 10-50 ml/min extend to q6-12hr; CCr <10 ml/min dose q12-16hr

### Systemic infections

**Adult and child ≥40 kg (88 lb):** PO 250-500 mg q6hr; **IV**/IM 2-8 g daily in divided doses q4-6hr

**Child <40 kg:** PO 50-100 mg/kg/day in divided doses q6-8hr; **IV**/IM 50-500 mg/kg/day in divided doses q6-8hr

### Bacterial meningitis

**Adult/adolescent:** IM/**IV** 150-200 mg/kg/day in divided doses, q3-4hr; IDSA IV 12 g divided q4hr

**Infant/child:** IM/**IV** 150-200 mg/kg/day in divided doses q3-4hr; IDSA dose IV 300 mg/kg/day divided q6hr

**Neonate >7 days and >2000 g:** IM/**IV** 200 mg/kg/day divided q6hr; IDSA dose IV 200 mg/kg/day divided q6-8hr

### Prevention of bacterial endocarditis

**Adult:** IM/**IV** 2 g 30 min before procedure

**Child:** IM/**IV** 50 mg/kg 30 min before procedure, max 2 g

### GI/GU infections other than caused by *N. gonorrhoeae*

**Adult and child >40 kg:** PO 250-500 mg q6hr, may use larger dose for more serious infections

**Child <40 kg:** PO 50 mg/kg/day in divided doses q6-8hr

**Available forms:** Powder for inj 125, 250, 500 mg, 1, 2, 10 g; **IV** inf 500 mg, 1, 2 g; caps 250, 500 mg; powder for oral susp, 125, 250, 500 mg/5 mg

## Implementation

**PO route**

• Give in even doses around the clock; product must be taken for 10-14 days to ensure organism death and prevent superinfection; store caps in tight container; store after reconstituting in refrigerator up to 2 wk, 1 wk room temperature

• Tabs may be crushed or caps opened and mixed with water

• Shake susp well before each dose; store for 2 wk in refrigerator or 1 wk at room temperature

**IM route (painful)**

• **Reconstitute** with 125 mg/0.9-1.2 ml; 250 mg/0.9-1.9 ml; 500 mg/1.2-1.8 ml; 1 g/2.4-7.4 ml; 2 g/6.8 ml

• **Give** deep in large muscle mass

**IV route**

• **Reconstitute** with 125 mg/0.9-1.2 ml; 250 mg/0.9-1.9 ml; 500 mg/1.2-1.8 ml; 1 g/2.4-7.4 ml; 2 g/6.8 ml

**Direct IV route**

• **Give** over 3-5 min in lower dosages (125-500 mg) or over 15 min in higher dosages (1-2 g)

**Intermittent IV infusion route**

• **Give** after diluting with 0.9% NaCl, LR, $D_5W$, $D_5$/0.45% NaCl; use 50 ml of sol and dilute to concentration of <30 mg/ml

**Y-site compatibilities:** Acyclovir, alemtuzumab, amifostine, allopurinol, argatroban, azithromycin, aztreonam, carmustine, cyclophosphamide, cytarabine, DAUNOrubicin, dexrazoxane, doxapram, DOXOrubicin liposome, enalaprilat, esmolol, etoposide phosphate, famotidine, filgrastim, fludarabine, foscarnet, gallium, gemtuzumab, granisetron, heparin, regular insulin, labetalol, lepirudin, leucovorin, liposome, magnesium sulfate, mannitol, melphalan, meperidine, milrinone, morphine, multivitamins, ofloxacin,

penicillin G potassium, perphenazine, phytonadione, potassium acetate, potassium chloride, propofol, remifentanil, thiotepa, tolazoline, vecuronium, vinBLAStine, vit B with C, zoledronic acid

**Y-site incompatibilities:** Calcium gluconate, EPINEPHrine, fluconazole, hetastarch, HYDROmorphone, hydrALAZINE, ondansetron, sargramostim, verapamil, vinorelbine

## ADVERSE EFFECTS

**GI:** *Nausea, vomiting, diarrhea,* pseudomembranous colitis, stomatitis, black hairy tongue
**GU:** Oliguria, proteinuria, hematuria, *vaginitis, moniliasis,* glomerulonephritis
**HEMA:** Anemia, increased bleeding time, bone marrow depression, granulocytopenia, leukopenia, eosinophilia, hemolysis
**INTEG:** *Rash,* urticaria, toxic epidermal necrolysis, erythema, multiforme
**SYST:** Anaphylaxis, serum sickness, Stevens-Johnson syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Moderate, in duodenum (35%-50%) |
| **Distribution** | Readily in body tissues, fluids, CSF; crosses placenta |
| **Excretion** | Breast milk; kidney unchanged (70%), removed by dialysis |
| **Half-life** | 50-110 min |

### Pharmacodynamics

| | PO | IM | IV |
|---|---|---|---|
| **Onset** | Rapid | Rapid | Rapid |
| **Peak** | 2 hr | 1 hr | Rapid |
| **Duration** | Unknown | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Allopurinol: increased ampicillin-induced skin rash, monitor for rash
Probenecid: increased ampicillin levels, decreased renal excretion

### Drug classifications

Contraceptives (oral): may decrease contraceptive effectiveness; use reliable contraception, use alternative contraception
H2 antagonists, proton pump inhibitors: decreased ampicillin level
Oral anticoagulants: increased bleeding, monitor INR/PTT

### Drug/lab test

Increased: eosinophil
Decreased: conjugated estrogens in pregnancy, conjugated estriol, Hgb, WBC, platelets
False positive: urine glucose
Interfere: urine glucose (Clinitest, Benedict's reagent, cupric $SO_4$)

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for previous sensitivity reaction to penicillins or other cephalosporins; cross-sensitivity between penicillins and cephalosporins is common
- Assess patient for signs and symptoms of **infection**, including characteristics of wounds, sputum, urine, stool, WBC $>10{,}000/mm^3$, earache, fever; obtain baseline information and during treatment
- Obtain C&S before beginning product therapy to identify if correct treatment has been initiated
- **Assess for allergic reactions:** rash, urticaria, pruritus, chills, fever, joint pain; angioedema may occur a few days after therapy begins; EPINEPHrine and resuscitation equipment should be on unit for anaphylactic reaction; also, check for ampicillin rash: pruritic, red, raised; identify allergies before using
- Identify urine output, hematuria; if decreasing, notify prescriber (may indicate nephrotoxicity)
- Monitor renal studies: urinalysis, protein, blood, BUN, creatinine
- Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test monthly if patient is on long-term therapy
- Monitor electrolytes: potassium, sodium, chloride monthly if patient is on long-term therapy
- Assess bowel pattern daily; if severe diarrhea occurs, product should be discontinued; may indicate pseudomembranous colitis
- Assess for **overgrowth of infection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum
- Pregnancy/breastfeeding: Use only if clearly needed, cautious use in breastfeeding, excreted in breast milk

### Patient/family education

- Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
- Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate superinfection
- Instruct patient to take all medication prescribed for the length of time ordered
- Advise patient to notify prescriber of diarrhea with blood or pus, which may indicate pseudomembranous colitis

• Tab may be crushed; cap may be opened and mixed with water; to use alternative contraception

### Evaluation

**Positive therapeutic outcome**

• Absence of signs/symptoms of infection (WBC <10,000, temp WNL)
• Reported improvement in symptoms of infection

## TREATMENT OF ANAPHYLAXIS:

Withdraw product, maintain airway, administer EPINEPHrine, aminophylline, $O_2$, **IV** corticosteroids

## ampicillin/sulbactam (Rx)

(am-pi-sill'in/sul-bak'tam)

**Unasyn**

*Func. class.:* Broad-spectrum antiinfective
*Chem. class.:* Aminopenicillin

**ACTION:** Interferes with cell wall replication of susceptible organisms; the cell wall, rendered osmotically unstable, swells and bursts from osmotic pressure; lysis due to cell wall autolytic enzymes; this combination extends the spectrum of activity and inhibits β-lactamase that may inactivate ampicillin

**Therapeutic outcome:** Bactericidal against *Staphylococcus aureus, Klebsiella, Bacteroides fragilis, Enterobacter, Acinetobacter calcoaceticus, Pneumococcus, Enterococcus, Streptococcus, Escherichia coli, Proteus mirabilis, Neisseria meningitidis, Neisseria gonorrhoeae, Shigella, Salmonella,* and *Haemophilus influenzae* organisms; use only with β-lactamase–producing strain of infection

**USES:** Skin infections, intraabdominal infections, gynecological infections, asthma, cellulitis, diabetes mellitus, diabetic foot ulcer, dialysis, diarrhea, eczema, IBS, leukemia, meningitis, nosocomial pneumonia, ulcerative colitis; *Actinobacter, Actinomyces, Bacillus anthracis, Bacteroides, Bifidobacterium, Bordetella pertussis, Borrelia burgdorferi, Brucella, Clostridium, Corynebacterium diptheriae/xerosis, Eikenella corrodens, Enterococcus faecalis, Erysipelothrix rhusiopathiae, Escherichia coli, Eubacterium, Fusobacterium, Gardnerella vaginalis, Haemophilus influenzae* (beta-lactamase negative/positive), *Helicobacter pylori, Klebsiella, Lactobacillus, Leptospira, Listeria monocytogenes, Moraxella catarrhalis, Morganella morganii, Neisseria gonorrhoeae, Pasteurella multocida, Peptococcus, Peptostreptococcus, Porphyromonas, Prevotella, Propionibacterium, Proteus mirabilis, Proteus vulgaris, Providencia rettgeri, Providencia stuartii, Salmonella, Shigella, Staphylococcus aureus* (MSSA)/*epidermidis/saprophyticus, Streptococcus agalactiae/dysgalactiae/pneumoniae/pyrogenes, Treponema pallidum,* viridans streptococci

**Unlabeled uses:** Hospital/community-acquired pneumonia, infective endocarditis, pelvic inflammatory disease

## CONTRAINDICATIONS

Hypersensitivity to ampicillin, or sulbactam

**Precautions:** Pregnancy, breastfeeding, neonates, hypersensitivity to cephalosporins, renal disease, mononucleosis, viral infections, syphilis

## DOSAGE AND ROUTES

**Adult and child >40 kg:** IM/**IV** 1 g ampicillin and 0.5 g sulbactam to 2 g ampicillin, and 1 g sulbactam q6hr, not to exceed 4 g/day sulbactam
**Child <40 kg:** **IV** 100-200 mg/kg/day (ampicillin component) divided q6hr, max 4 g/day

### Renal dose

**Adult ≥40 kg:** IM/IV CCr 15-29 ml/min dose q12hr; CCr 5-14 ml/min dose q24hr

### Community-acquired pneumonia (unlabeled)

**Adult:** IV 3 g q12hr in combination X ≥ 5 days

### Endocarditis (unlabeled)

**Adult:** IV 12 g divided q8hr
**Child:** IV 300 mg/kg per day divided q8hr

### Pelvic inflammatory disease (unlabeled)

**Adult/adolescent:** IV 3 g q6hr in combination

**Available forms:** Powder for inj 1.5 g (1 g ampicillin, 0.5 g sulbactam), 3 g (2 g ampicillin, 1 g sulbactam), 15 g (10 g ampicillin, 5 g sulbactam)

### Implementation

• Scratch test to assess allergy after securing order from prescriber; usually done when penicillin is only product choice

**IM route**

• Reconstitute by adding 3.2 ml/1.5 g or 6.4 ml/3 g; use sterile water, 0.5% or 2% lidocaine; give within 1 hr of preparation; give deep in large muscle mass, aspirate
• Do not use IM in child
• Give after C&S completed; on empty stomach

**IV direct route**

• Give **IV** after diluting 1.5 g/3.2 ml sterile water for inj; or 3 g/6.4 ml (250 mg ampicillin/125 mg sulbactam); allow to stand until foaming stops; give directly over 10-15 min, inject slowly

**Intermittent IV infusion route**
- Dilute further in 50 ml or more of $D_5W$, $D_5$/10.45% NaCl, 10% invert sugar in water, LR, 6% sodium lactate, isotonic NaCl; administer within 1 hr after reconstitution; give as an intermittent inf over 15-30 min

**Y-site compatibilities:** Alemtuzumab, amifostine, aminocaproic acid, anidulafungin, argatroban, atenolol, bivalirudin, bleomycin, CARBOplatin, carmustine, cefepime, CISplatin, codeine, cyclophosphamide, cytarabine, DAPTOmycin, DAUNOrubicin liposome, dexmedetomidine, DOCEtaxel, doxacurium, DOXOrubicin liposomal, eptifibatide, etoposide, fenoldopam, filgrastim, fludarabine, fluorouracil, foscarnet, gallium, gatifloxacin, gemcitabine, granisetron, irinotecan, levofloxacin, linezolid, methotrexate, metroNIDAZOLE, octreotide, oxaliplatin, PACLitaxel, palonosetron, pamidronate, pancuronium, pantoprazole, PEMEtrexed, remifentanil, riTUXimab, rocuronium, tacrolimus, teniposide, thiotepa, tigecycline, tirofiban, TNA, TPN, trastuzumab, vecuronium, vinCRIStine, voriconazole, zoledronic acid

**Y-site incompatibilities:** IDArubicin, ondansetron, sargramostim

## ADVERSE EFFECTS

**CNS:** Lethargy, hallucinations, anxiety, depression, twitching, coma, seizures

**GI:** *Nausea, vomiting, diarrhea,* increased AST, ALT, abdominal pain, glossitis, colitis, pseudomembranous colitis, hepatic necrosis/failure, black hairy tongue

**GU:** Oliguria, proteinuria, hematuria, *vaginitis, moniliasis,* glomerulonephritis, dysuria

**HEMA:** Anemia, increased bleeding time, bone marrow depression, granulocytopenia, leukopenia, eosinophilia, hemolysis

**INTEG:** Injection site reactions, rash, edema, urticaria

**SYST:** Anaphylaxis, serum sickness, toxic epidermal necrolysis, Stevens-Johnson syndrome, hypoalbuminemia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (IM) |
| **Distribution** | Readily in body tissues, fluids, CSF; crosses placenta |
| **Metabolism** | Liver (10%-50%) |
| **Excretion** | Breast milk; kidney unchanged (75%) |
| **Half-life** | 50-110 min (ampicillin) |

### Pharmacodynamics

| | IM | IV |
|---|---|---|
| **Onset** | Rapid | Immediate |
| **Peak** | 1 hr | Infusion's end |
| **Duration** | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Allopurinol: ampicillin-induced skin rash, check for rash
Methotrexate: increased methotrexate level
Probenecid: increased ampicillin levels, decreased renal excretion

### Drug classifications

Oral anticoagulants: increased bleeding risk, check INR, PT

### Drug/lab test

False positive: urine glucose, urine protein

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for previous sensitivity reaction to penicillins or cephalosporins; cross-sensitivity between penicillins and cephalosporins is common
- Assess patient for signs and symptoms of **infection,** including characteristics of wounds, sputum, urine, stool, WBC >10,000/$mm^3$, earache, fever; obtain baseline information and during treatment; complete C&S before beginning product therapy to identify if correct treatment has been initiated
- **Assess for allergic reactions:** rash, urticaria, pruritus, chills, fever, joint pain; angioedema may occur a few days after therapy begins; EPINEPHrine and resuscitation equipment should be on unit for anaphylactic reaction
- Identify urine output; if decreasing, notify prescriber (may indicate nephrotoxicity)
- Assess renal studies: urinalysis, protein, BUN, creatinine
- Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test monthly if patient is on long-term therapy
- Monitor electrolytes: potassium, sodium, chloride monthly if patient is on long-term therapy
- Assess bowel pattern daily; if severe diarrhea occurs, product should be discontinued; may indicate pseudomembranous colitis
- Monitor for bleeding: ecchymosis, bleeding gums, hematuria, stool guaiac daily if on long-term therapy
- Assess for superinfection: perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum

• Pregnancy/breastfeeding: Use only if clearly needed, cautious use in breastfeeding, excreted in breast milk

### Patient/family education

• Teach patient to report sore throat, bruising, bleeding, joint pain, persistent diarrhea; may indicate blood dyscrasias (rare) or superinfection
• Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate pseudomembranous colitis
• Instruct patient to use another form of contraception other than oral contraceptives
• **Instruct patient to report immediately pseudomembranous colitis:** fever, diarrhea with pus, blood, or mucus; may occur up to 4 wk after treatment
• Instruct patient to wear or carry emergency ID if allergic to penicillin products

### Evaluation

**Positive therapeutic outcome**

• Absence of signs/symptoms of infection (WBC $<10{,}000/mm^3$, temp WNL, absence of red draining wounds, earache)
• Reported improvement in symptoms of infection

## TREATMENT OF OVERDOSE:

Withdraw product, maintain airway, administer EPINEPHrine, aminophylline, $O_2$, **IV** corticosteroids for anaphylaxis

## anakinra (Rx)

(an-ah-kin'rah)
**Kineret**
*Func. class.:* Antirheumatic agent (disease modifying), immunomodulator
*Chem. class.:* Recombinant form of human interleukin-1 receptor antagonist (IL-1Ra)

**Do not confuse:** anakinra/amikacin
Kineret/Amikin

## ACTION:

A form of human interleukin-1 receptor antagonist (IL-1Ra) produced by DNA technology; blocks activity of IL-1, resulting in decreased inflammation, cartilage degradation, bone resorption

**Therapeutic outcome:** Decreased pain, inflammation

## USES:

Reduction in signs and symptoms of moderate to severe active rheumatoid arthritis in patients 18 years of age or older who have not responded to other disease-modifying agents, neonatal-onset multisystem inflammatory disease

## CONTRAINDICATIONS

Hypersensitivity to *Escherichia coli*–derived proteins or this product, sepsis, latex

**Precautions:** Pregnancy, breastfeeding, children, geriatric, renal impairment, active infections, immunosuppression, neoplastic disease, asthma

## DOSAGE AND ROUTES

### Rheumatoid arthritis

**Adult:** SUBCUT 100 mg daily at same time of the day

### Renal dose

**Adult:** CCr <30 ml/min; SUBCUT 100 mg every other day

### Neonatal-onset multisystem inflammatory disease

**Adult/child:** SUBCUT 1-2 mg/kg/day; may increase by 0.5-1 mg to max 8 mg/kg/day (adult) or 7.6 mg/kg/day (child)

**Available forms:** Inj, 100 mg/0.67 ml prefilled glass syringe

### Implementation

• Do not use if cloudy or discolored or if particulate is present; protect from light
• Do not admix with other sol or medications, do not use filter
• Store in the refrigerator, do not freeze, do not shake, protect from light

## ADVERSE EFFECTS

**CNS:** Headache, fever
**CV:** Cardiac arrest
**EENT:** Sinusitis
**GI:** Abdominal pain, nausea, diarrhea
**HEMA:** Neutropenia
**INTEG:** Rash, *inj site reaction,* allergic reaction
**MISC:** Flulike symptoms, infection
**MS:** *Worsening of RA, arthralgia*
**RESP:** *URI*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (SUBCUT) |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Urine |
| **Half-life** | 4-6 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 3-7 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Rilonacept: do not use

TNF blocking agents: Increased severe infection risk, do not use together

### Drug/lab
Increase: eosinophils
Decrease: platelets, WBCs

### Drug classifications
Antibody reactions: decreased
Vaccines: Avoid concurrent use; immunizations should be brought up to date before treatment

## NURSING CONSIDERATIONS
### Assessment
- **Rheumatoid arthritis:** assess pain, stiffness, ROM, swelling of joints during treatment
- Assess for inj site pain, swelling; usually occur after 2 inj (4-5 days)
- Assess for **infections**, stop treatment if present, do not start if patient has active infection
- Pregnancy/breastfeeding: Identify if pregnancy is planned or suspected, or if breastfeeding, use only if clearly needed

### Patient/family education
- Teach patient about self-administration if appropriate: inj should be made in thigh, abdomen, upper arm; rotate sites at least 1 in from old site, store in refrigerator, do not freeze, do not shake
- Advise patient to notify prescriber if pregnancy is planned or suspected, avoid breastfeeding
- Advise patient not to receive vaccines while taking this product, update vaccines before treatment

### Evaluation
**Positive therapeutic outcome**
- Decreased inflammation, pain in joints

**⚠ HIGH ALERT**

# anastrozole (Rx)
(an-ass-stroh′zole)
**Arimidex**
*Func. class.:* Antineoplastic
*Chem. class.:* Aromatase inhibitor

**ACTION:** Highly selective nonsteroidal aromatase inhibitor that lowers serum estradiol concentrations; many breast cancers have strong estrogen receptors

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** Advanced breast carcinoma in estrogen-receptor-positive patients (usually postmenopausal); patients with advanced disease on tamoxifen, adjunct therapy, endometriosis

## CONTRAINDICATIONS
Pregnancy, hypersensitivity, breastfeeding

**Precautions:** Children, geriatric, cardiac/hepatic disease, premenopausal females, osteoporosis

## DOSAGE AND ROUTES
**Adult:** PO 1 mg daily; continue for 5 yr in ERT early breast cancer who have already received 2-3 yr of tamoxifen and are switched to anastrozole, max 5 yr; may also combine with tamoxifen for up to 10 yr

**Available forms:** Tabs 1 mg

### Implementation
- Do not break, crush, or chew enteric products
- Give with food or fluids for GI upset; repeat dose may be needed if vomiting occurs
- Store in light-resistant container at room temperature

## ADVERSE EFFECTS
**CNS:** Hot flashes, headache, light-headedness, depression, dizziness, confusion, insomnia, anxiety, fatigue, mood changes
**CV:** Chest pain, hypertension, thrombophlebitis, edema, MI, CVA, cerebral infarction, angina, *vasodilation*, PE, DVT
**GI:** Nausea, vomiting, altered taste leading to anorexia, diarrhea, constipation, abdominal pain, dry mouth, weight gain
**GU:** Vaginal bleeding, pruritus vulvae, vaginal dryness, pelvic pain, UTI
**HEMA:** Leukopenia, anemia
**INTEG:** *Rash,* Stevens-Johnson syndrome
**MISC:** Hypercholesterolemia
**MS:** Bone pain, myalgia, asthenia, bone loss, osteoporosis, arthralgia, fractures
**RESP:** Cough, sinusitis, dyspnea, pulmonary embolism

### Pharmacokinetics
| | |
|---|---|
| **Absorption** | Adequately absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Feces, urine |
| **Half-life** | 50 hr |

### Pharmacodynamics
| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 4-7 hr |
| **Duration** | Unknown |

## INTERACTIONS
### Drug/drug
- Do not use with oral contraceptives, estrogen, tamoxifen, androstenedione, DHEA

### Drug/lab test

Increased: GGT, AST, ALT, alkaline phosphatase, cholesterol, LDL

## NURSING CONSIDERATIONS

### Assessment

- Monitor bone mineral density, cholesterol, lipid panel periodically
- **Assess serious skin reactions:** Stevens-Johnson syndrome
- Not effective in hormone receptor-negative disease, use only in postmenopausal women
- That tumor flare—increase in size of tumor, increased bone pain—may occur and will subside rapidly; may take analgesics for pain
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected or if breastfeeding, do not use in pregnancy or breastfeeding

### Patient/family education

- Instruct patient to report any complaints, side effects to health care prescriber; if dose is missed, do not double next dose
- Advise patient that vaginal bleeding, pruritus, hot flashes, can occur and are reversible after discontinuing treatment
- Teach patient to take adequate calcium, vitamin D; risk of bone loss/fractures
- Inform patient that rash or lesions are temporary and may become large during beginning therapy
- **Tumor flare:** The increase in size of tumor, increased bone pain may occur and will subside rapidly, may take analgesics for the pain

### Evaluation

**Positive therapeutic outcome**

- Decreased spread of malignant cells in breast cancer

## anidulafungin (Rx)

(a-nid-yoo-luh-fun′jin)

**Eraxis**

*Func. class.:* Antifungal, systemic

*Chem. class.:* Echinocandin

**ACTION:** Inhibits fungal enzyme synthesis; causes direct damage to fungal cell wall

**Therapeutic outcome:** Decreased symptoms of candida infection, negative culture

**USES:** Esophageal candidiasis, *Aspergillosis, Candida albicans, Candida glabrata, Candida parapsilosis, Candida tropicalis*

## CONTRAINDICATIONS

Hypersensitivity to this product or other echinocandins

**Precautions:** Pregnancy, breastfeeding, children, severe hepatic disease

## DOSAGE AND ROUTES

### Candidemia and other candidal infections; serious systemic infections

**Adult: IV** loading dose 200 mg on day 1, then 100 mg/day until 14 days or more since last positive culture

### Esophageal candidiasis

**Adult: IV** loading dose 100 mg on day 1, then 50 mg/day for at least 14 days and for at least 7 days after symptoms are resolved

**Available forms:** Powder for injection, lyophilized 50, 100 mg

### Implementation

**IV route**

- Visually inspect prepared infusions for particulate matter and discoloration—do not use if present; give by IV infusion only, after dilution
- **Reconstitution:** Reconstitute each 50 mg or 100 mg vial/15 ml or 30 ml of sterile water for injection, respectively (3.33 mg/ml)
- **Storage:** Reconstituted solutions are stable for ≤24 hr at room temperature
- **Dilution:** Do not use any other diluents besides dextrose 5% in water ($D_5W$) or sodium chloride 0.9% (NS)
- ***Preparation of the 200-mg loading dose infusion:*** Withdraw the contents of either four 50-mg reconstituted vials OR two 100-mg reconstituted vials and add to an IV infusion bag or bottle containing 200 ml of $D_5W$ or NS to give a total infusion volume of 260 ml
- ***Preparation of the 100-mg daily infusion:*** Withdraw the contents of one 100-mg reconstituted vial OR two 50-mg reconstituted vials and add to an IV infusion bag or bottle containing 100 ml of $D_5W$ or NS to give a total infusion volume of 130 ml
- ***Preparation of a 50-mg daily infusion:*** Withdraw the contents of one 50-mg reconstituted vial and add to an IV infusion bag or bottle containing 50 ml of $D_5W$ or NS to give a total infusion volume of 65 ml

**Intermittent IV INF route**

- Do not mix or co-infuse with other medications
- Administer as a slow IV infusion at a rate of 1.4 ml/min or 84 ml/hr; minimum duration of infusion is 180 min for the 200-mg dose, 90 min for the 100-mg dose, and 45 min for the 50-mg dose

• Store reconstituted vials at 59°-86° F (15°-30° C) for up to 24 hr; do not freeze (dehydrated alcohol); store reconstituted vials at 36°-46° F (2°-7° C) (sterile water) for up to 24 hr; do not freeze

**IV compatibilities:** Acyclovir, alemtuzumab, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amiodarone hydrochloride, amphotericin B lipid complex, amphotericin B liposome, ampicillin, ampicillin sulbactam, argatroban, arsenic trioxide, atenolol, atracurium, azithromycin, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, busulfan, butorphanol, calcium chloride/gluconate, CARBOplatin, carmustine, caspofungin, ceFAZolin, cefepime, cefotaxime, cefoTEtan, cefOXitin, ceftAZidime, ceftizoxime, ceftRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, cyclophosphamide, cycloSPORINE, cytarabine, dacarbazine, DACTINomycin, DAUNOrubicin, DAUNOrubicin liposome, dexamethasone, dexmedetomidine, dexrazoxane, diazepam, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doripenem, doxacurium, DOXOrubicin, DOXOrubicin liposomal, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, eptifibatide, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, foscarnet, fosphenytoin, furosemide, gallium, ganciclovir, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, haloperidol, heparin, hydrALAZINE, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, inamrinone, insulin (regular), irinotecan, isoproterenol, ketorolac, labetalol, leucovorin, levofloxacin, lidocaine, linezolid injection, LORazepam, mannitol, mechlorethamine, melphalan, meperidine, meropenem, mesna, metaraminol, methotrexate, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, mitoMYcin, mitoXANtrone, mivacurium, morphine, moxifloxacin, mycophenolate mofetil, nafcillin, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, pantoprazole, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, piperacillin-tazobactam, polymyxin B, potassium acetate/chloride, procainamide, prochlorperazine, promethazine, propranolol, quiNIDine, quinupristin-dalfopristin, ranitidine, remifentanil, rocuronium, sodium acetate, streptozocin, succinylcholine, SUFentanil citrate, sulfamethoxazole-trimethoprim, tacrolimus, teniposide, theophylline, thiopental, thiotepa, ticarcillin, ticarcillin-clavulanate, tirofiban, tobramycin, topotecan, trimethobenzamide, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

## ADVERSE EFFECTS

### Candidemia/other candida infections

**CNS:** Seizures, dizziness, *headache*
**CV:** Deep vein thrombosis, atrial fibrillation, right bundle branch block, hypotension, QT prolongation, sinus arrhythmia, thrombophlebitis superficial, ventricular extrasystoles (rare)
**GI:** *Nausea; anorexia; vomiting; diarrhea; increased AST, ALT*
**META:** Hypokalemia

### Esophageal candidiasis

**CNS:** *Headache*
**GI:** *Nausea, anorexia, vomiting, diarrhea,* hepatic necrosis
**HEMA:** Neutropenia, thrombocytopenia, leukopenia, coagulopathy
**INTEG:** *Rash,* urticaria, itching, flushing
**META:** Hypocalcemia, hyperglycemia, hyperkalemia, hypernatremia, hypomagnesemia (rare)
**MS:** *Back pain, rigors*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Steady state after loading dose, protein binding 84% |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Distribution 0.5-1 hr, terminal 40-50 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Drug/lab test

Increased: amylase, bilirubin, CPK, creatinine, ECG, lipase, PT, alk phos
Decreased: platelets, magnesium, potassium, transferase, urea

## NURSING CONSIDERATIONS

### Assessment

• Assess for **infection**, clearing of cultures during treatment; obtain culture at baseline and throughout; product may be started as soon as culture is taken, those with HIV pharyngeal candidiasis may need antifungals

• **Blood dyscrasias (rare):** monitor CBC (RBC, Hct, Hgb), differential, platelet count periodically; notify prescriber of results
• Monitor hepatic studies before and during treatment: bilirubin, AST, ALT, alk phosphatase; uric acid, as needed
• Assess for **bleeding:** hematuria, heme-positive stools, bruising or petechiae, mucosa or orifices; blood dyscrasias can occur
• Assess for GI symptoms: frequency of stools, cramping, if severe diarrhea occurs, electrolytes may need to be given

### Patient/family education

• Advise patient to notify prescriber if pregnancy is suspected or planned; use nonhormonal form of contraception while taking this product
• Instruct patient to avoid breastfeeding while taking this product
• Advise patient to inform prescriber of kidney or liver disease
• Advise patient to report bleeding
• Teach patient to report signs of infection: increased temp, sore throat, flulike symptoms
• Teach patient to notify prescriber of nausea, vomiting, diarrhea, jaundice, anorexia, clay-colored stools, dark urine; hepatotoxicity may occur

### Evaluation

**Positive therapeutic outcome**

• Decreased symptoms of candidal infection, negative culture

**RARELY USED**

## antihemophilic factor recombinant, single chain

(an-tee-hee-moe-fil'ik-fak'tor ree-kom'buh-nant)

**Afstyla**

*Func. class.:* Hemostatic-coagulation factor

**USES:** In adults and children with hemophilia A (congenital factor VIII deficiency) for on-demand treatment and control of bleeding episodes, prophylaxis to reduce the frequency of bleeding episodes, perioperative management of bleeding

## CONTRAINDICATIONS

Hypersensitivity to this product or hamster protein

## DOSAGE AND ROUTES

One unit per kilogram body weight will raise the factor VIII level by 2 IU/dl (2.1)

**Calculating required dose:** (2.1) Dose (IU) = Body weight (kg) × Desired factor VIII rise (IU/dl or % of normal) × 0.5 (IU/kg per IU/dl)

**Routine prophylaxis (2.1):**
**Adult/adolescent (12 yr):** IV 20-50 IU/kg 2-3 times qwk initially Child **(<12 yr): IV** 30-50 IU/kg 2-3 times qwk initially

## apraclonidine ophthalmic

*See Appendix B*

## apremilast

(a-pre'mi-last)

**Otezla**

*Func. class.:* Musculoskeletal agent: disease-modifying antirheumatic drug (DMARD)

**ACTION:** A phosphodiesterase-4 (PDE4) inhibitor specific for cyclic adenosine monophosphate (cAMP). Inhibition of PDE4 results in an increase in intracellular concentration of cAMP, with a partial inhibition of proinflammatory mediators and an increase in the production of some antiinflammatory mediators

**Therapeutic outcome:** Resolution of symptoms of psoriatic arthritis or plaque psoriasis

**USES:** Treatment of active psoriatic arthritis; severe plaque psoriasis (in those not a candidate for phototherapy)

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, depression/suicidal, renal disease (CCr <30 ml/min)

## DOSAGE AND ROUTES

### Treatment of active psoriatic arthritis/severe plaque psoriasis

**Adult: PO** To reduce the risk for gastrointestinal symptoms, titrate to a final dose of 30 mg bid; day 1: 10 mg PO AM; day 2: 10 mg AM and PM; day 3: 10 mg AM and 20 mg PM; day 4: 20 mg AM and PM; day 5: 20 mg AM and 30 mg PM; day 6 and thereafter: 30 mg bid

### Renal dose

**Adult:** PO CCr ≥30 ml/min: no change; CCr <30 ml/min: 30 mg every day. Initially, 10 mg **AM** days 1-3; 20 mg **AM** days 4 and 5; 30 mg every day for day 6 and thereafter

**Available forms:** Tab 30 mg; starter pack

### Implementation

Give whole; do not crush, break, or chew; give without regard to meals

## ADVERSE EFFECTS

**CNS:** *Headache,* depression, suicidal ideation, fatigue, insomnia
**GI:** Diarrhea, nausea, vomiting, abdominal pain, frequent bowel movements, dyspepsia, weight loss
**MS:** Back pain
**RESP:** URI, pharyngitis, bronchitis
**SYST:** Hypersensitivity reactions

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 68% bound to plasma proteins |
| **Metabolism** | Liver, metabolized by CYP3A4 |
| **Excretion** | Urine (58%), feces (39%) |
| **Half-life** | 6-9 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2.5 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

CYP3A4 inducers (rifampin, isoniazid, pyrazinamide, barbiturates, phenytoin, carbamazepine, enzalutamide), avoid concurrent use; decreased effect of apremilast

### Drug/herb

CYP3A4 inducers (St. Johns' wort), avoid concurrent use: decreased effect of apremilast

## NURSING CONSIDERATIONS

### Assessment

- **Psoriatic arthritis/severe plaque psoriasis:** assess for hypersensitivity reactions
- **Pregnancy and breastfeeding:** use only if benefits outweigh fetal risk if used during pregnancy, call 877-311-8972; cautious use in breastfeeding
- Assess for depression and suicidal ideation, mood changes; for renal failure or severe renal impairment (CCr <30 ml/min), dosage reduction is required

### Patient/family education

- Teach patient to report rash, hypersensitivity reactions
- Teach patient to avoid use in pregnancy and use cautiously in breastfeeding; if used during pregnancy, call 877-311-8972 to enroll in registry
- Advise patient to be alert for depression and suicidal ideation, mood changes; if these occur, notify prescriber immediately

### Evaluation

**Positive therapeutic outcome**

- Resolution of symptoms of psoriatic arthritis or plaque psoriasis

## aprepitant (Rx)

(ap-re'pi-tant)
**Emend**
## fosaprepitant
**Emend**
*Func. class.:* Antiemetic
*Chem. class.:* Miscellaneous

**Do not confuse:** aprepitant/fosaprepitant

**ACTION:** Selective antagonist of human substance P/neurokinin 1 ($NK_1$) receptors, decreasing emetic reflex

**Therapeutic outcome:** Decreased nausea, vomiting during chemotherapy

**USES:** Prevention of nausea, vomiting associated with cancer chemotherapy (highly emetogenic/moderately emetogenic) including high-dose cisplatin; used in combination with other antiemetics; postop nausea, vomiting

## CONTRAINDICATIONS

Hypersensitivity to this product, polysorbate 80

**Precautions:** Pregnancy, breastfeeding, children, geriatric, hepatic disease

## DOSAGE AND ROUTES

### Prevention of nausea/vomiting after chemotherapy antineoplastics

**Adult:** PO day 1 (1 hr prior to chemotherapy) aprepitant 125 mg with 12 mg 1st dose of aprepitant on day 1 of regimen (fosaprepitant)

### Prevention of postop nausea/vomiting

**Adult:** PO 40 mg within 3 hr of induction of anesthesia

**Available forms:** Caps 40, 80, 125 mg; powder for inj, 150 mg; combo pack cap 80-125 mg

### Implementation

**PO route**

- Give PO on 3-day schedule, given with other antiemetics
- Take first dose 1 hr prior to chemotherapy
- Store at room temperature; keep in original bottles, blisters

**IV route**

- Only approved as a substitute for the 1st dose of aprepitant in 3-day regimen

- Reconstitution: use aseptic technique; inject 5 ml 0.9% NaCl into the vial, directing stream to wall of vial to prevent foam; swirl; do not shake
- Prepare inf bag with 145 ml/150 mg do not dilute or reconstitute with any divalent cations such as calcium, magnesium, including LR, Hartmann's sol
- Withdraw the entire volume from vial and transfer to inf bag; total volume 115 ml (1 mg/1 ml)
- Gently invert bag 2-3 times; reconstituted sol is stable for 24 hr at lower room temperature or <25° C
- Visually inspect for particulates and discoloration
- Infuse over 20-30 min, stable for 24 hr at room temperature

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness,* insomnia, anxiety, depression, confusion, peripheral neuropathy
**CV:** Bradycardia, tachycardia, DVT, hypertension, hypotension
**GI:** *Diarrhea; constipation;* abdominal pain; anorexia; gastritis; increased AST, ALT; *nausea;* vomiting; heartburn
**GU:** Increased BUN, serum creatine, proteinuria, dysuria
**HEMA:** Anemia, thrombocytopenia, neutropenia
**INTEG:** Pruritus, rash, urticaria, infection reaction
**MISC:** Asthenia, fatigue, dehydration, fever, hiccups, tinnitus, alopecia
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 95% protein bound |
| **Metabolism** | Liver (CYP3A4 enzymes to an active metabolite) |
| **Excretion** | Not in kidneys |
| **Half-life** | 10-12 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

ALPRAZolam, midazolam, triazolam: increased level of each product, decrease dose of each product
Paroxetine: decreased action of both products

### Drug classifications

CYP2C9 substrates (phenytoin, TOLBUTamide, warfarin), hormonal contraceptives: decreased action
CYP3A4 inhibitors (clarithromycin, diltiazem, itraconazole, ketoconazole, nefazodone, nelfinavir, ritonavir, troleandomycin): increased aprepitant action
CYP3A4 inducers (carBAMazepine, phenytoin, rifampin): decreased aprepitant action
CYP3A4 substrates (ALPRAZolam, dexamethasone, DOCEtaxel, etoposide, ifosfamide, imatinib, irinotecan, methylPREDNISolone, midazolam, PACLitaxel, pimozide, triazolam, vinBLAStine, vinCRIStine, vinorelbine): increased action

### Drug/food

Grapefruit juice: decreased effect

## NURSING CONSIDERATIONS

### Assessment

- Assess for hypersensitivity reactions: pruritus, rash, urticaria, anaphylaxis
- Assess for absence of nausea, vomiting during chemotherapy
- CBC, LFTs, creatinine baseline and periodically
- Pregnancy/breastfeeding: Use only if clearly needed, do not breastfeed. excretion unknown

### Patient/family education

- Teach to report diarrhea, constipation
- Advise to take only as prescribed
- Advise to report all medication to prescriber prior to taking this medication
- Instruct to use nonhormonal form of contraception while taking this agent
- Advise those on warfarin to have clotting monitored closely during 2-wk period following administration of aprepitant
- Teach to avoid breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Absence of nausea, vomiting during cancer chemotherapy

## arformoterol (Rx)

(ar-for-moe'ter-ole)
**Brovana**
*Func. class.:* Long-acting adrenergic $\beta_2$-agonist, sympathomimetic, bronchodilator

**Do not confuse:** Brovana/Boniva

**ACTION:** Causes bronchodilation by action on $\beta_2$ (pulmonary) receptors by increasing levels of cyclic AMP, which relaxes smooth muscle; produces bronchodilation, CNS, and cardiac stimulation, and increased diuresis and gastric acid secretion; longer acting than isoproterenol

**Therapeutic outcome:** Absence of dyspnea, wheezing after 1 hr, improved airway exchange, improved ABGs

## USES:

Maintenance bronchospasm prevention in COPD, including chronic bronchitis, emphysema

## CONTRAINDICATIONS

Hypersensitivity to sympathomimetics, this product, or racemic formoterol; tachydysrhythmias, severe cardiac disease, heart block, children, monotherapy in asthma

**Precautions:** Pregnancy, breastfeeding, cardiac disorders, hyperthyroidism, diabetes mellitus, hypertension, prostatic hypertrophy, closed-angle glaucoma, seizures, hypoglycemia

**BLACK BOX WARNING:** Asthma-related death

## DOSAGE AND ROUTES

### COPD

**Adult:** NEB 15 mcg, bid, AM, PM

**Available forms:** Inh sol 15 mcg/2 ml

### Implementation

- Must be used by nebulization; give over 5-10 min
- Store in refrigerator; if stored at room temp, discard after 6 wk or if past expiration date, whichever is sooner

## ADVERSE EFFECTS

**CNS:** *Tremors, anxiety,* insomnia, headache, dizziness, stimulation, *restlessness,* hallucinations, flushing, irritability
**CV:** Palpitations, tachycardia, hypo/hypertension, angina, dysrhythmias, AV block, heart failure, prolonged QT, supraventricular tachycardia
**EENT:** Dry nose, irritation of nose and throat
**GI:** Heartburn, nausea, vomiting
**MISC:** Flushing, sweating, anorexia, bad taste/smell changes, hypokalemia, anaphylaxis, *hypoglycemia*
**MS:** Muscle cramps, back pain
**RESP:** Cough, wheezing, dyspnea, bronchospasm, dry throat

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Crosses placenta, protein binding 52%-65% |
| **Metabolism** | Direct conjugation by CYP2D6, CYP2C19, extensively |
| **Excretion** | Urine 63%, feces 11% |
| **Half-life** | Terminal (COPD) 26 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | 1-1½ hr |
| **Duration** | 4-6 hr |

## INTERACTIONS

### Individual drugs

Oxytoxics: increased severe hypotension
Theophylline: increased toxicity

### Drug classifications

Adrenergics, MAOIs, tricyclics: increased action of arformoterol; do not use together
Class IA/III antidysrhythmics, MAOIs, tricyclics: increased QT prolongation
Nebulized bronchodilators: increased action of nebulized bronchodilators
**Other β-blockers:** decreased arformoterol action, asthma-related death, avoid concurrent use
Potassium-losing diuretics: increased ECG changes/hypokalemia

### Drug/herb

Caffeine (kola nut, green/black tea, guarana, yerba maté, coffee, chocolate): increased stimulation

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Assess respiratory function: vital capacity, forced expiratory volume, ABGs; lung sounds, heart rate and rhythm, B/P, sputum (baseline and peak); actively deteriorating COPD and asthma-related death may occur; a rescue inhaler should be readily available

- Determine that patient has not received theophylline therapy or other bronchodilators before giving dose
- Assess patient's ability to self-medicate
- Assess for allergic reactions
- Assess **paradoxical bronchospasm;** hold medication, notify prescriber if bronchospasm occurs
- Pregnancy/breastfeeding: Use only if benefits outweigh fetal risk, cautious use in breastfeeding

### Patient/family education

**BLACK BOX WARNING:** Teach patient to use exactly as prescribed, that death has resulted from asthma with products similar to this one, to have a rescue inhaler always

- Advise patient not to use OTC medications; excess stimulation may occur
- An opened unit-dose vial should be used immediately, store vials in refrigerator

• To notify prescriber if there is more frequent use needed

### Evaluation

**Positive therapeutic outcome**

• Absence of dyspnea, wheezing after 1 hr, improved airway exchange, improved ABGs

**⚠ HIGH ALERT**

## argatroban (Rx)

(are-ga-troe'ban)

**Argatroban**

*Func. class.:* Anticoagulant

*Chem. class.:* Direct Thrombin inhibitor

**Do not confuse:** argatroban/Aggrastat/Lorgaran

**ACTION:** Direct inhibitor of thrombin that is derived from L-arginine; it reversibly binds to the thrombin active site

**Therapeutic outcome:** Absence or decrease of thrombosis

**USES:** Thrombosis prophylaxis or treatment; anticoagulation prevention/treatment of thrombosis in heparin-induced thrombocytopenia (HIT); percutaneous coronary intervention (PCI) in those with a history of HIT, deep vein thrombosis, pulmonary embolism

## CONTRAINDICATIONS

Hypersensitivity, overt major bleeding

**Precautions:** Pregnancy, breastfeeding, children, intracranial bleeding, impaired renal function, hepatic disease, severe hypertension, after lumbar puncture, spinal anesthesia, major surgery/trauma, congenital or acquired bleeding, GI ulcers, abrupt discontinuation

## DOSAGE AND ROUTES

### Prevention/treatment of thrombosis (heparin-induced thrombocytopenia)

**Adult:** CONT **IV** inf 2 mcg/kg/min; adjust dose until steady-state aPPT is 1.5-3 × initial baseline, not to exceed 100 sec, max dose 10 mcg/kg/min

### Percutaneous coronary intervention (PCI) in HIT

**Adult:** **IV** inf 25 mcg/kg/min and a bol of 350 mcg/kg given over 3-5 min, check ACT 5-10 min after bol is completed, proceed if ACT >300 sec; if ACT <300 sec, give another 150 mcg/kg bol and increase infusion rate to 30 mcg/kg/min; recheck ACT in 5-10 min; if ACT >450 sec, decrease infusion rate to 15 mcg/kg/min; recheck ACT in 5-10 min; once ACT is therapeutic, continue for duration of procedure

### Hepatic dose

**Adult:** Cont inf 0.5 mcg/kg/min, adjust rate based on APTT

**Available forms:** Inj 100 mg/ml (2.5 ml) (must dilute 100-fold), 50 mg/50 ml, 125 mg/125 ml

### Implementation

• Avoid all IM inj that may cause bleeding

**IV, direct route**

• **For PCI:** 350 mg/kg bol, and continuous inf of 25 mcg/kg/min, check ACT 5-10 min after bolus

**Intermittent IV INF route**

• **Dilute** in 0.9% NaCl, $D_5W$, LR to a final conc 1 mg/ml; **dilute** each 2.5-ml vial 100-fold by mixing with 250 ml of diluent, mix by repeated inversion of the diluent bag for 1 min; may be slightly hazy briefly

• Dosage adjustment may be made after review of aPTT, not to exceed 10 mcg/kg/min

## ADVERSE EFFECTS

**CNS:** Fever, intracranial bleeding, headache

**CV:** Atrial fibrillation, ventricular tachycardia, coronary thrombosis, MI, myocardial ischemia, coronary occlusion, bradycardia, chest pain, hypotension

**GI:** Nausea, vomiting, abdominal pain, diarrhea, GI bleeding

**GU:** Hematuria, abnormal kidney function, UTI

**HEMA:** Hemorrhage

**MISC:** *Back pain,* infection

**RESP:** Dyspnea, coughing, hemoptysis, pulmonary edema

**SYST:** Sepsis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | To extracellular fluid, 54% plasma protein binding |
| **Metabolism** | Liver |
| **Excretion** | Feces |
| **Half-life** | 39-51 min |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Clopidogrel, dipyridamole, heparin, ticlopidine, warfarin: increased bleeding risk, avoid using concurrently

### Drug classifications
Antiplatelets, glycoprotein IIb/IIIa antagonists (abciximab, eptifibatide, tirofiban), NSAIDs, other anticoagulants, salicylates, thrombolytics (alteplase, reteplase, tenecteplase, urokinase): increased risk of bleeding, avoid using concurrently

### Drug/herb
Garlic, ginger, ginkgo, horse chestnut: increased bleeding risk

### Drug/lab
Decrease: Hgb/HcT

## NURSING CONSIDERATIONS
### Assessment
- Obtain baseline aPTT before treatment; do not start treatment if aPTT ratio ≥2.5, then aPTT 4 hr after initiation of treatment and at least daily thereafter; if aPTT above target, stop inf for 2 hr, then restart at 50%, take aPTT in 4 hr; if below target, increase inf rate by 20%, take aPTT in 4 hr, do not exceed inf rate of 0.21 mg/kg/hr without checking for coagulation abnormalities
- Monitor aPTT, which should be 1.5-3 × control, draw blood for ACT q20-30min during long PCI
- Assess for bleeding gums, petechiae, ecchymosis, black tarry stools, hematuria/epistaxis, decreased B/P, HCT, vaginal bleeding, and possible hemorrhage
- Fever, skin rash, urticaria
- **Anaphylaxis:** assess for dyspnea, rash during treatment
- Pregnancy/breastfeeding: Use only if benefits outweigh fetal risk, do not breastfeed, excretion unknown

### Patient/family education
- Advise patient to use soft-bristle toothbrush to avoid bleeding gums, avoid contact sports, use electric razor, avoid IM inj
- Instruct patient to report any signs of bleeding: gums, under skin, urine, stools; trouble breathing, wheezing, skin rash
- Pregnancy/breastfeeding: Teach patient to notify provider if planning to become pregnant, breastfeeding
- Advise patient to notify provider of hepatic/GI disease, recent surgery, injury
- Advise patient not to use OTC products, herbals unless approved by prescriber

### Evaluation
#### Positive therapeutic outcome
- Absence or decrease of thrombosis

## ARIPiprazole (Rx)
(a-rip-ip-pra′zol)
**Abilify, Abilify Discmelt, Abilify Maintena**
*Func. class.:* Antipsychotic/neuroleptic

**Do not confuse:** ARIPiprazole/RABEprazole

**ACTION:** Exact mechanism unknown; may be mediated through both dopamine type 2 ($D_2$) and serotonin type 2 ($5\text{-}HT_2$) antagonism, dopamine system stabilizer

**Therapeutic outcome:** Decreased excitement, hallucinations, delusions, paranoia, reorganization of patterns of thought, speech

**USES:** Schizophrenia and bipolar disorder (adults and adolescents), agitation, mania, major depressive disorder, short-term mania or mixed episodes of bipolar disorder, irritability in autism

## CONTRAINDICATIONS
Hypersensitivity, breastfeeding, seizure disorders

**Precautions:** Pregnancy, geriatric, renal/cardiac/hepatic disease, neutropenia

**BLACK BOX WARNING:** Children with depression, dementia, suicidal ideation

## DOSAGE AND ROUTES
### Schizophrenia
**Adult:** PO 10-15 mg/day; if needed, dosage may be increased to 30 mg daily after 2 wk; maintenance 15 mg/day, periodically reassess; IM/EXT REL (monthly inj susp) 400 mg qmo
**Adolescent 13-17 yr:** 2 mg/day, may increase to 5 mg after 2 days, then 10 mg after 2 more days, max 30 mg/day

### Major depressive disorder
**Adult:** PO 2-5 mg/day as an adjunct to other antidepressant treatment; adjust by 5 mg at ≥1 wk (range, 2-15 mg/day)

### Agitation in bipolar disorder/schizophrenia
**Adult:** IM 9.75 mg as a single dose; may start with a lower dose, max 30 mg/day

### Bipolar disorder
**Adult:** 15 mg/day, may increase to 30 mg/day if needed (monotherapy): adjunctive to lithium or valproate PO 10-15 mg qd, may increase to 30 mg as needed
**Child ≥10 yr/adolescent:** PO 2 mg, titrate to 5 mg/day after 2 days to a target of 10 mg/day after another 2 days

### Irritability associated with autism

**Child ≥6 yr/adolescent:** PO 2 mg/day, increase to 5 mg/day after 1 wk, may increase to 10-15 mg/day if needed, dose changes should not occur more frequently than q1wk

### Tourette's disorder

**Child 6-18 yr and ≥ 50 kg:** PO 2 mg/day × 2 days, then increase to 5 mg/day, target 10 mg/day on day 8

**Child 6-18 yr and <50 kg:** PO 2 mg/day × 2 days, then increase to 5 mg/day then gradually increase in weekly intervals, max 10 mg/day

### Potential CYP2D6 inhibitor, strong CYP3A4 inhibitors

**Adult:** PO reduce to 50% of usual dose, increase dose when CYP2D6, CYP3A4 inhibitor is withdrawn

### Combination of strong CYP3A4/CYP2D6 inhibitors

**Adult:** PO reduce to 25% of usual dose

**Available forms:** Tabs 2, 5, 10, 15, 20, 30 mg; inj 9.75 mg/1.3 ml; orally disintegrating tab 10, 15 mg; oral sol 1 mg/ml; susp for injection 441 mg/1.6 ml, 662 mg/2.4 ml, 882 mg/3.2 ml; susp EXT REL 300, 400 mg

### Implementation

- Administer reduced dose in geriatric
- Decreased stimulus by dimming lights, avoiding loud noises
- Supervise ambulation until patient is stabilized on medication; do not involve in strenuous exercise program because fainting is possible; patient should not stand still for a long time
- Store in tight, light-resistant container
- Available as ready to use
- Oral sol can be substituted for tablet mg per mg up to 25-mg dose; patients receiving 30-mg tablets should receive 25 mg of sol
- IM route: EXT REL monthly (Abilify Maintena)
- Do not give IV or subcut

## ADVERSE EFFECTS

**CNS:** *Drowsiness, insomnia, agitation, anxiety, headache,* seizures, neuroleptic malignant syndrome, *lightheadedness, akathisia, asthenia, tremor,* stroke, suicidal ideation, dystonia, cogwheel rigidity

**CV:** Orthostatic hypotension, tachycardia, chest pain, hypertension, peripheral edema

**EENT:** Blurred vision, rhinitis

**GI:** Constipation, *nausea,* vomiting, jaundice, weight gain

**INTEG:** *Rash*

**META:** Hyperglycemia, dyslipidemia

**MS:** Musculoskeletal pain/stiffness, myalgia

**RESP:** *Cough*

**SYST:** Death in geriatric patients with dementia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding, 90% |
| **Metabolism** | Liver, extensively to major active metabolism |
| **Excretion** | Unknown |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Alcohol: increased sedation

CarBAMazepine: decreased effects of ARIPiprazole

Erythromycin, FLUoxetine, ketoconazole, quiNIDine, PARoxetine: increased effects of ARIPiprazole, reduce dose

Famotidine, valproate: decreased ARIPiprazole level

Lithium: increased EPS

### Drug classifications

Antihypertensives: Increased antihypertensive effect, monitor BP

Antipsychotics: increased EPS

CNS depressants: increased sedation

CYP3A4/CYP2D6 inhibitors: increased effects of ARIPiprazole, reduce dose

CYPA34 inducers: decreased effects of ARIPiprazole; increase dose as needed

### Drug/herb

St. John's wort: decreased ARIPiprazole effect

### Drug/Lab

False positive: amphetamine drug screen

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Assess mental status before initial administration, children/young adults may exhibit suicidal thoughts/behaviors, the smallest amount of product should be given; elderly patients with dementia-related psychosis are at increased risk of death

- Check for swallowing of PO medication; check for hoarding or giving of medication to other patients
- Monitor I&O ratio; palpate bladder if urinary output is low
- Monitor liver function tests qmo, AIMS assessment, neurologic function

• Assess affect, orientation, LOC, reflexes, gait, coordination, sleep pattern disturbances
• Monitor B/P standing and lying; also pulse, respirations; take q4hr during initial treatment; establish baseline before starting treatment; report drops of 30 mm Hg; watch for ECG changes
• Assess for dizziness, faintness, palpitations, tachycardia on rising
• Assess for EPS, including akathisia (inability to sit still, no pattern to movements), tardive dyskinesia (bizarre movements of the jaw, mouth, tongue, extremities), pseudoparkinsonism (rigidity, tremors, pill rolling, shuffling gait)
• **Assess for neuroleptic malignant syndrome:** hyperthermia, increased CPK, altered mental status, muscle rigidity
• Monitor weight, lipid profile, fasting blood glucose
• Assess skin turgor daily
• Assess for constipation, urinary retention daily; if these occur, increase bulk and water in diet
• **Beers:** Avoid in older adults, high risk of CVA, delirium, may use in schizophrenia, bipolar, or short-term use as an antiemetic in chemotherapy
• **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, pregnant patient should be enrolled in the National Pregnancy Registry for Atypical Antipsychotics 866-961-2388, avoid breastfeeding, use only if benefits outweigh fetal risk

### Patient/family education

• Advise patient that orthostatic hypotension may occur and to rise from sitting or lying position gradually
• Advise patient to avoid hot tubs, hot showers, tub baths; hypotension may occur
• Instruct patient to avoid abrupt withdrawal of this product; EPS may result; product should be withdrawn slowly
• Teach patient to avoid OTC preparations (cough, hayfever, cold) unless approved by prescriber, because serious product interactions may occur; avoid use with alcohol, CNS depressants; increased drowsiness may occur
• Advise patient to avoid hazardous activities if drowsy or dizzy
• Explain importance of compliance with product regimen
• Advise patient, family to report impaired vision, tremors, muscle twitching, urinary retention
• Instruct patient to take extra precautions to stay cool in hot weather, that heat stroke may occur

**BLACK BOX WARNING:** Teach patient to report suicidal thoughts/behaviors, dementia immediately

### Evaluation

**Positive therapeutic outcome**
• Decreased emotional excitement, hallucinations, delusions, paranoia; reorganization of patterns of thought, speech

## TREATMENT OF OVERDOSE:

Lavage if orally ingested; provide airway; *do not induce vomiting*

## asenapine (Rx)

(a-sen′a-peen)
**Saphris**
*Func. class.:* Antipsychotic, atypical; DOPamine/serotonin antagonist
*Chem. class.:* Dibenzazepine

## ACTION:

Unknown; may be mediated through both dopamine type 2 ($D_2$) and serotonin type 2 ($5\text{-}HT_{2A}$) antagonism

**Therapeutic outcome:** Decrease in delusions, hallucinations

## USES:

Bipolar 1 disorder, schizophrenia

## CONTRAINDICATIONS

Breastfeeding, hypersensitivity

**Precautions:** Pregnancy, children, geriatric patients, cardiac/renal/hepatic disease, breast cancer, Parkinson's disease, dementia, seizure disorder, CNS depression, agranulocytosis, QT prolongation, torsades de pointes, suicidal ideation, substance abuse, diabetes mellitus

**BLACK BOX WARNING:** Increased mortality in elderly patients with dementia-related psychosis

## DOSAGE AND ROUTES

### Schizophrenia

**Adult:** SL 5 mg bid, max 20 mg/day

### Bipolar 1 disorder

**Adult:** SL 10 mg bid, may decrease to 5 mg bid as needed, max 20 mg/day

### Acute mania, mixed episodes (bipolar 1 disorder monotherapy)

**Child:** 10-17 SL 2.5 mg bid, may increase after 3 days to 5 mg bid, then after 3 more days, increase to 10 mg bid as tolerated

**Available forms:** SL tab 2.5, 10 mg

### Implementation

**PO route**
• Give anticholinergic agent for EPS
• Avoid use with CNS depressants

• **SL tab:** remove tab, place tab under tongue; after it dissolves, swallow; advise not to chew, crush or swallow tabs, not to eat or drink for 10 min
• Supervise ambulation until patient is stabilized on medication; do not involve in strenuous exercise program because fainting is possible; patient should not stand still for a long time
• Increase fluids to prevent constipation
• Store in tight, light-resistant container

## ADVERSE EFFECTS

**CNS:** *EPS, pseudoparkinsonism, akathisia, dystonia, tardive dyskinesia, drowsiness, insomnia, agitation, anxiety, headache,* seizures, neuroleptic malignant syndrome, dizziness, suicidal ideation, drowsiness, depression
**CV:** Orthostatic hypotension, sinus tachycardia, heart failure, QT prolongation, stroke, bundle branch block
**ENDO:** Hyperglycemia, hyperlipidemia
**GI:** *Nausea,* vomiting, *constipation,* weight gain, increased appetite; oral hypoesthesia/paresthesia (SL)
**HEMA:** Thrombocytopenia, agranulocytosis, anemia, leukopenia
**INTEG:** Serious allergic reaction (anaphylaxis, angioedema)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 95% |
| **Metabolism** | Liver |
| **Excretion** | Unknown |
| **Half-life** | Terminal 24 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | ½-1½ hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol: increased sedation
Chloroquine, clarithromycin, droperidol, erythromycin, haloperidol, methadone, pentamidine: increased QT prolongation
CarBAMazepine: increased asenapine excretion

### Drug classifications

Other CNS depressants: increased sedation
CYP2D6 inhibitors/substrates (SSRIs), other antipsychotics: increased EPS
Class IA/III antidysrhythmics, some phenothiazines, β-agonists, local anesthetics, tricyclics: increased QT prolongation
CYP2D6 inducers (carBAMazepine, barbiturates, phenytoin, rifampin): decreased asenapine action
SSRIs: increased serotonin syndrome

### Drug/herb

Kava: increased CNS depression, increased EPS
Betel palm: increased EPS

### Drug/lab test

Increased: cholesterol, glucose, LFTs, lipids, prolactin levels, triglycerides
Decreased: sodium

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Assess mental status before initial administration; watch for suicidal thoughts and behaviors; dementia and death may occur in the elderly

• Assess for affect, orientation, LOC, reflexes, gait, coordination, sleep pattern disturbances
• Monitor B/P standing and lying, pulse, respirations; take these q4hr during initial treatment; establish baseline before starting treatment; report drops of 30 mm Hg; watch for ECG changes; QT prolongation may occur
• Monitor for dizziness, faintness, palpitations, tachycardia on rising
• Assess for **EPS,** including akathisia, tardive dyskinesia (bizarre movements of the jaw, mouth, tongue, extremities), pseudoparkinsonism (rigidity, tremors, pill rolling, shuffling gait)
• **Assess for neuroleptic malignant syndrome:** hyperthermia, increased CPK, altered mental status, muscle rigidity
• Assess for constipation daily; increase bulk and water in diet if needed
• Assess for weight gain, hyperglycemia, metabolic changes in diabetes
• Pregnancy/breastfeeding: Identify if pregnancy is planned or suspected, if pregnant register at the National Pregnancy Registry for Atypical Antipsychotics 866-961-2388, do not breastfeed, use only if benefits, outweigh fetal risk

### Patient/family education

• Caution patient that orthostatic hypotension may occur and to rise from sitting or lying position gradually
• Teach patient to avoid hot tubs, hot showers, tub baths; hypotension may occur
• Advise patient to avoid abrupt withdrawal of this product; EPS may result; product should be withdrawn slowly
• Advise patient to avoid OTC preparations (cough, hay fever, cold) unless approved by prescriber, serious product interactions may occur; avoid use of alcohol, increased drowsiness may occur
• Advise patient to avoid hazardous activities if drowsy or dizzy
• Weight, thyroid function studies, serum prolactin, lipid profile, serum electrolytes,

creatinine, pregnancy test, neurologic function, LFTs, glycosylated hemoglobulin A1C, CBC, blood glucose, AIMS assessment baseline and periodically
• Advise patient about compliance with product regimen
• Advise patient that heat stroke may occur in hot weather; take extra precautions to stay cool
• Advise patient to use contraception, inform prescriber if pregnancy is planned or suspected
• Advise patient to report suicidal thoughts/behaviors immediately
• Pregnancy/breastfeeding: Teach patient to enroll in the registry, not to breastfeed

### Evaluation

**Positive therapeutic outcome**
• Therapeutic response: decrease in emotional excitement, hallucinations, delusions, paranoia; reorganization of patterns of thought, speech

## TREATMENT OF OVERDOSE:

Lavage if orally ingested; provide airway; *do not induce vomiting*

**⚠ HIGH ALERT**

## aspirin (acetylsalicylic acid, ASA) (OTC)

(as′pir-in)
**APC-ASA Coated Aspirin 🍁, Apo-Asa 🍁, A.S.A., Asaphen 🍁, Asatab 🍁, Ascriptin Enteric, Aspergum, Aspirin 🍁, Aspir-Low, Aspirtrin, Bayer Aspirin, Bayer Children's Aspirin, Bufferin, Ecotrin, Entrophen 🍁, Equaline, Good Sense Aspirin, Halfprin, Lowprin 🍁, Novasen 🍁, PMS-ASA 🍁, Rivasa 🍁, St. Joseph Children's, St. Joseph's Adult, Walgreens Aspirin Adult**
*Func. class.:* Nonopioid analgesic
*Chem. class.:* Salicylate

**Do not confuse:** **Aspirin**/Anacin, **Adult Low**/Anacin-3

**ACTION:** Blocks pain impulses by blocking COX-1 in CNS, reduces inflammation by inhibition of prostaglandin synthesis; antipyretic action results from vasodilatation of peripheral vessels; decreases platelet aggregation

**Therapeutic outcome:** Decreased pain, inflammation, fever; absence of MI, transient ischemic attacks, thrombosis

**USES:** Mild to moderate pain or fever including rheumatoid arthritis, osteoarthritis, thromboembolic disorders, transient ischemic attacks, rheumatic fever, post-MI, prophylaxis of MI, ischemic stroke, angina; acute MI

**Unlabeled uses:** Prevention of cataracts (long-term use), prevention of pregnancy loss in women with clotting disorders, polycythemia vera

## CONTRAINDICATIONS

Pregnancy, breastfeeding, children <12 yr, children with flulike symptoms, hypersensitivity to salicylates, tartrazine (FDC yellow dye #5), GI bleeding, bleeding disorders, vit K deficiency, peptic ulcer, acute bronchospasm, agranulocytosis, increased intracranial pressure, intracranial bleeding, nasal polyps, urticaria

**Precautions:** Abrupt discontinuation, acetaminophen/NSAIDs hypersensitivity, acid/base imbalance, alcoholism, ascites, asthma, bone marrow suppression, geriatric patients, dehydration, G6PD deficiency, gout, heart failure, anemia, renal/hepatic disease, pre/postoperatively, gastritis, pregnancy **C** 1st trimester

## DOSAGE AND ROUTES

### Rheumatoid arthritis, osteoarthritis, other inflammatory conditions

**Adult:** PO 3 g/day in divided doses q4-6hr, target salicylate level 150-300 mcg/ml

### Juvenile rheumatoid arthritis

**Child:** PO or RECT 90-130 mg/kg/day in divided doses, target salicylate level 150-300 mcg/ml

### MI, stroke prophylaxis

**Adult:** PO 50-325 mg/day

### Pain/fever

**Adult:** PO/RECT 325-1000 mg q4hr prn, max 4 g/day
**Child 2-11 yr:** PO 10-15 mg/kg/dose q4hr, max 4 g/day

### Thromboembolic disorders

**Adult:** PO 325-650 mg/day or bid

### Transient ischemic attacks (risk)

**Adult:** PO 50-325 mg/day (grade 1A)

### Prevention of recurrent MI

**Adult:** PO 75-162 mg/day

### CABG

**Adult:** PO 325 mg/day starting 6 hr post-procedure, continue for 1 yr

### PTCA

**Adult:** PO 325 mg 2 hr presurgery, then 160-325 mg daily

### Evolving MI with ST segment elevation (STEMI)

**Adult:** PO 160-325 mg nonenteric, chewed and swallowed immediately, maintenance 75-162 mg qd

**Available forms:** Tabs 81, 325, 500, 650, 800 mg; chewable tabs 81 mg; supp 300, 600, mg; gum 227 mg; enteric coated tabs 81, 325, 500, 975 mg; ext rel 800 mg; del rel tabs 325, 500 mg; supp 300, 600 mg

### Implementation

**PO route**

- Do not break, crush, or chew enteric product
- Administer to patient crushed or whole; chewable tab should be chewed
- Give with food or milk to decrease gastric symptoms; separate by 2 hr of enteric product; absorption may be slowed
- Give antacids 1-2 hr after enteric products
- Give with 8 oz of water and have patient sit upright for 30 min after dose; discard tabs if vinegar-like smell is present; avoid if allergic to tartrazine
- Give ½ hr before planned exercise

**Rectal route**

- Place suppository in refrigerator for at least 30 min before removing wrapper

## ADVERSE EFFECTS

**CNS:** Stimulation, drowsiness, dizziness, confusion, seizures, headache, flushing, hallucinations, coma, intracranial hemorrhage
**CV:** Rapid pulse, pulmonary edema, dysrhythmias
**EENT:** Tinnitus, hearing loss
**ENDO:** Hypoglycemia, hyponatremia, hypokalemia
**GI:** *Nausea, vomiting,* GI bleeding, diarrhea, heartburn, anorexia, hepatitis, GI ulcer
**HEMA:** Thrombocytopenia, agranulocytosis, leukopenia, neutropenia, hemolytic anemia, increased PT, PTT, bleeding time
**INTEG:** *Rash,* urticaria, bruising
**RESP:** Wheezing, hyperpnea, bronchospasm
**SYST:** Reye's syndrome (children), anaphylaxis, laryngeal edema, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed, small intestine (PO); erratic (enteric); slow (RECT) |
| **Distribution** | Rapidly, widely distributed; crosses placenta, protein binding 90% |
| **Metabolism** | Liver, extensively |
| **Excretion** | Inactive metabolites, kidney; breast milk |
| **Half-life** | 15-20 min (low doses); 9 hr (high doses) |

### Pharmacodynamics

| | PO | RECT |
|---|---|---|
| **Onset** | 15-30 min | Slow |
| **Peak** | 1-2 hr | 4-5 hr |
| **Duration** | 4-6 hr | 6-7 hr |

PO: Enteric-coated: Onset 10-30 min, duration 2-4 hr,
Solution: Onset 10-30 min, peak 15-30 min, duration 2-4 hr

## INTERACTIONS

### Individual drugs

Alcohol, cefamandole, clopidogrel, eptifibatide, heparin, plicamycin, ticlopidine, tirofiban: increased risk of bleeding, monitor for bleeding
Ammonium chloride, nizatidine: increased salicylate level
Insulin, methotrexate, phenytoin, valproic acid, increased effects of each specific product, monitor for increased effects of each product
Nitroglycerin: increased hypotension
Probenecid: decreased effects of probenecid
Spironolactone, sulfinpyrazone: decreased effects

### Drug classifications

ACE inhibitors: decreased antihypertensive effect, monitor BP
Antacids (high doses), corticosteroids, urinary alkalizers: decreased effects of aspirin, monitor for decreased aspirin effects
Anticoagulants, thrombolytics: increased risk of bleeding
Diuretics (loop), sulfonylamides, NSAIDs, β-blockers: decreased effect of each specific product
NSAIDs, antiinflammatories, steroids: increased gastric ulcers
Penicillins, oral hypoglycemics, sulfonamides, thrombolytic agents: increased effects of each specific product
Salicylates: decreased blood glucose levels
Urinary acidifiers: increased salicylate levels

### Drug/herb

Feverfew, garlic, ginger, ginkgo, ginseng *(Panax),* horse chestnut: increased risk of bleeding

### Drug/food

Foods acidifying urine may increase aspirin levels
Fish oil (omega-3-fatty acids): increased risk of bleeding

### Drug/lab test

Increased: coagulation studies, liver function studies, serum uric acid, amylase, $CO_2$, urinary protein

Decreased: serum potassium, cholesterol
Interference: VMA, 5-HIAA, xylose tolerance test, TSH, pregnancy test

## NURSING CONSIDERATIONS

### Assessment

- Assess for **pain:** character, location, intensity, ROM before and 1 hr after administration
- Monitor liver function studies: AST, ALT, bilirubin, creatinine if patient is on long-term therapy
- Monitor renal function studies: BUN, urine creatinine if patient is on long-term therapy
- Monitor blood studies: CBC, Hct, Hgb, PT if patient is on long-term therapy
- Check I&O ratio; decreasing output may indicate renal failure (long-term therapy)
- **Assess hepatotoxicity:** dark urine, clay-colored stools, yellowing of the skin and sclera, itching, abdominal pain, fever, diarrhea if patient is on long-term therapy
- **Assess for allergic reactions:** rash, urticaria; if these occur, product may have to be discontinued; in patients with asthma, nasal polyps, allergies, severe allergic reactions may occur
- Assess for **ototoxicity:** tinnitus, ringing, roaring in ears; audiometric testing needed before, after long-term therapy
- Monitor **salicylate level:** therapeutic level 150-300 mcg/ml for chronic inflammation
- Check edema in feet, ankles, legs
- Identify prior product history; there are many product interactions
- Beers: Avoid chronic use in older adults, GI bleeding may occur

### Patient/family education

- Teach patient to report any symptoms of renal/hepatic toxicity, visual changes, ototoxicity, allergic reactions, bleeding (long-term therapy)
- Instruct patient to take with 8 oz of water and sit upright for 30 min after dose to facilitate product passing into the stomach; to discard tabs if vinegar-like smell is present; to avoid if allergic to tartrazine
- Instruct patient not to exceed recommended dosage; acute poisoning may result
- Advise patient to read label on other OTC products; many contain aspirin
- Inform patient that the therapeutic response takes 2 wk (arthritis)
- Teach patient to report tinnitus, confusion, diarrhea, sweating, hyperventilation
- Advise patient to avoid alcohol ingestion; GI bleeding may occur
- Advise patient with allergies, nasal polyps, asthma, that allergic reactions may develop
- Instruct patient to read labels on other OTC products: may contain salicylates
- Teach patient not to give to children or teens with flulike symptoms or chicken pox; Reye's syndrome may develop
- Instruct patient not to use during 3rd trimester of pregnancy
- Teach patient to take with a full glass of water

### Evaluation

**Positive therapeutic outcome**

- Decreased pain
- Decreased inflammation
- Decreased fever
- Absence of MI
- Absence of transient ischemic attacks, thrombosis

## TREATMENT OF OVERDOSE:

Lavage, monitor electrolytes, VS

**⚠ HIGH ALERT**

**RARELY USED**

## aspirin/omeprazole

(as'pir-in/oh-mep'ra-zole)
**Yosprala**
*Func. class.:* Platelet inhibitor, salicylate combination

**USES:** For the reduction of cardiovascular mortality and prevention of secondary cardiovascular and cerebrovascular events (MI prophylaxis, stroke prophylaxis) in patients at risk for aspirin-associated gastric ulcers and who also have a history of stroke, TIA, MI, angina (including unstable angina) or are post cardiac surgery (CABG, PTCA)

## CONTRAINDICATIONS

NSAID/salicylate hypersensitivity, viral infection

## DOSAGE AND ROUTES

**Adult:** PO 81 mg aspirin/40 mg omeprazole or 325 mg aspirin/40 mg omeprazole qday

## atazanavir (Rx)

(at-a-za-na'veer)
**Reyataz**
*Func. class.:* Antiretroviral
*Chem. class.:* Protease inhibitor

**ACTION:** Inhibits human immunodeficiency virus (HIV-1) protease, which prevents maturation of the infectious virus

**Therapeutic outcome:** Decreasing symptoms of HIV

**USES:** HIV-1 infection in combination with other antiretroviral agents

## CONTRAINDICATIONS

Hypersensitivity, Child-Pugh Class C

**Precautions:** Pregnancy, breastfeeding, children, geriatric, liver disease, alcoholism, antimicrobial resistance, AV block, diabetes, dialysis, elderly, women, hemophilia, hypercholesterolemia, immune reconstitution syndrome, lactic acidosis, pancreatitis, cholelithiasis, serious rash

## DOSAGE AND ROUTES

### Antiretroviral-naive patients

**Adult:** PO 400 mg daily

**Child ≥6 yr/adolescent ≤40 kg:** PO 300 mg with ritonavir 100 mg qd

**Child ≥6 yr/adolescent 20 to <40 kg:** PO 200 mg with ritonavir 100 mg qd

**Child ≥6 yr/adolescent 15 to <20 kg:** PO 150 mg with ritonavir 80 mg qd

### Antiretroviral-experienced patients

**Adult:** PO 300 mg daily and ritonavir 100 mg daily

**Pregnant adult/adolescent (2nd/3rd trimester) with $H_2$ blocker or tenofovir:** PO 400 mg with ritonavir 100 mg qd

**Child ≥6 yr/adolescent ≥40 kg:** PO 300 mg with ritonavir 100 mg qd

**Child ≥6 yr/adolescent 20 to <40 kg:** PO 200 mg with ritonavir 100 mg qd

**Infants ≥ 3 months and children 10 to <25 kg:** Oral powder 15 to <25 kg 250 mg/dose q24hr with ritonavir 80 mg/dose q24hr; 10 to <15 kg 200 mg/dose q24hr with ritonavir 80 mg/dose q24hr

### Hepatic dose

**Adult:** PO (Child-Pugh B) 300 mg daily; (Child-Pugh C) do not use

**Available forms:** Caps 100, 150, 200, 300 mg, oral powder 50 mg

### Implementation

- Administer with food; take 2 hr before or 1 hr after antacid or didanosine; swallow cap whole, do not open
- Oral powder: Use with food or beverage, mix 1 tablespoon of food with powder, then add another tablespoon of food to container, mix and feed; mix with 30 ml of liquid, give and mix another 15 ml to cup to remove residual and give, use within 1 hr of mixing

## ADVERSE EFFECTS

**CNS:** Headache, depression, dizziness, insomnia, peripheral neuropathy

**CV:** Increased PR interval

**EENT:** Yellowing of sclera

**GI:** *Diarrhea, abdominal pain, nausea,* vomiting, hepatotoxicity, cholelithiasis

**INTEG:** *Rash,* Stevens-Johnson syndrome, *photosensitivity,* DRESS

**MISC:** Fatigue, fever, arthralgia, back pain, cough, lipodystrophy, pain, gynecomastia, nephrolithiasis, lactic acidosis, hyperbilirubinemia (pregnancy, females, obesity)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid, increased with food |
| **Distribution** | 86% protein bound |
| **Metabolism** | Liver extensively by CYP3A4 |
| **Excretion** | 27% excreted unchanged in urine/feces (minimal) |
| **Half-life** | 7 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alfuzisun, ariprazole, brentuximab, cabazitaxel, carBAMazepine, cilostazol, colchine, eletriptan, eplerenone, crizotinib, DOCEtaxel, ixabepilone, iloperidine, lurasidone, maraviroc, nilotinib, vilazodone, vemurafenib, dasatinib, lapatinib, SORAfenib, trazodone, risperiDONE, raltegravir, QUEtiapine

Clarithromycin, romiDEPsin, ranolazine, salmeterol: increased QT prolongation

Chlorazepate, clarithromycin, cycloSPORINE, diazepam, irinotecan, midazolam, pimozide, sildenafil, sirolimus, tacrolimus, triazolam, warfarin: increased levels resulting in toxicity, monitor for toxicity

Didanosine, efavirenz, rifampin: decreased atazanavir levels

Indinavir: increased hyperbilirubinemia

Ritonavir, telaprevir: decreased telaprevir levels when used with atazanavir and ritonavir

### Drug classifications

Antacids, $H_2$-receptor antagonists, proton pump inhibitors, CYP3A4 inducers: decreased atazanavir levels

Antidepressants (tricyclics), antidysrhythmics, antifungals (itraconazole, ketoconazole, voriconazole) ergots, calcium channel blockers, HMG-CoA reductase inhibitors, immunosuppressants, other protease inhibitors (amprenavir, darunavir, fosamprenavir, indinavir, nelfivanavir, ritonavir, saquinavir): increased levels resulting in increased toxicity, monitor for toxicity

Contraceptives (oral), estrogens: increased effects (unboosted), decreased (boosted with ritonavir)

CYP3A4 substrates, CYP3A4 inhibitors: increased atazanavir levels

### Drug/herb

Red yeast rice: myopathy, rhabdomyolysis
St. John's wort: decreased atazanavir levels, avoid concurrent use

### Drug/lab test

Increased: AST, ALT, total bilirubin, amylase, lipase, CK
Decreased: Hgb, neutrophils, platelets

### Drug/food

Increased: drug bioavailability (to be taken with food)

## NURSING CONSIDERATIONS

### Assessment

- **Immune reconstitution syndrome:** when given with combination antiretroviral therapy
- Assess for hepatic failure; ALT, AST, bilirubin, do not use in Child-Pugh C
- Assess for signs of infection, anemia
- Monitor liver function studies: ALT, AST, bilirubin
- Monitor bowel pattern before, during treatment; if severe abdominal pain with bleeding occurs, product should be discontinued; monitor hydration
- If pregnant, call Antiretroviral Pregnancy Registry 800-258-4263, do not breastfeed, use additional contraception when boosted with ritonivir
- PR interval in those taking calcium channel blockers, digoxin
- Monitor viral load, CD4 count throughout treatment
- **Serious rash (Stevens-Johnson syndrome, DRESS):** most rashes last 1-4 wk; if serious, discontinue product
- **Immune Reconstitution syndrome:** time of onset is variable when given with combination antiretroviral therapy

### Patient/family education

- Advise to take as prescribed with other antiretrovirals as prescribed; if dose is missed, take as soon as remembered up to 1 hr before next dose; do not double dose; do not share with others
- Teach that product must be taken daily to maintain blood levels for duration of therapy
- To report yellowing of skin, sclera
- Instruct to notify prescriber if diarrhea, nausea, vomiting, rash occur; dizziness, lightheadedness; ECG may be altered
- Inform that product interacts with many products and St. John's wort; advise prescriber of all products, herbal products used
- Advise that redistribution of body fat may occur; the effect is not known
- Teach that product does not cure HIV-1 infection or prevent transmission to others, only controls symptoms
- Advise that if taking sildenafil with atazanavir, there may be an increased risk of phosphodiesterase type 5 inhibitor–associated adverse events, including hypotension and prolonged penile erection; notify physician promptly of these symptoms
- **Pregnancy/breastfeeding:** Encourage patient to register with the Antiretroviral Pregnancy Registry if pregnant, to notify provider if pregnancy is planned or suspected, not to breastfeed

### Evaluation

**Positive therapeutic outcome**

- Increasing CD4 counts; decreased viral load, resolution of symptoms of HIV-1 infection

**⚠ HIGH ALERT**

## atazanavir/cobicistat (Rx)

(at-a-za-na'veer/koe-bik'-i-stat)
**Evotaz**
*Func. class.:* Antiretroviral
*Chem. class.:* Protease inhibitor

**ACTION:** Inhibits human immunodeficiency virus (HIV-1) protease, which prevents maturation of the infectious virus; it combines a protease inhibitor with an enhancer

**Therapeutic outcome:** Decreasing symptoms of HIV

**USES:** HIV-1 infection in combination with other antiretroviral agents

## CONTRAINDICATIONS

Hypersensitivity, Child-Pugh Class C

**Precautions:** Pregnancy, breastfeeding, children, geriatric, liver disease, alcoholism, antimicrobial resistance, AV block, diabetes, dialysis, elderly, women, hemophilia, hypercholesterolemia, immune reconstitution syndrome, lactic acidosis, pancreatitis, cholelithiasis, serious rash

## DOSAGE AND ROUTES

**Adults: PO** 300 mg/150 mg qday in both treatment-naive and treatment-experienced patients
**Adolescents (unlabeled): PO** 300 mg/150 mg qday in combination with other antiretroviral agents as part of an alternative initial regimen (treatment-naïve)

**Available forms:** Tabs 300 mg/150 mg

### Implementation

- Antiretroviral drug resistance testing (preferably genotypic testing) is recommended before initiation of therapy in antiretroviral treatment-naïve patients and before changing therapy for treatment failure
- Give with food

## ADVERSE EFFECTS

**CNS:** Headache, depression, dizziness, insomnia, peripheral neuropathy
**CV:** Increased PR interval
**EENT:** Yellowing of sclera
**GI:** *Diarrhea, abdominal pain, nausea, vomiting,* hepatotoxicity, cholelithiasis
**INTEG:** *Rash,* Stevens-Johnson syndrome, *photosensitivity,* DRESS
**MISC:** Fatigue, fever, arthralgia, back pain, cough, lipodystrophy, pain, gynecomastia, nephrolithiasis, lactic acidosis, hyperbilirubinemia (pregnancy, females, obesity)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid, increased with food |
| **Distribution** | 86% protein bound |
| **Metabolism** | Liver extensively by CYP3A4 |
| **Excretion** | 27% excreted unchanged in urine/feces (minimal) |
| **Half-life** | 7 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Clorazepate, clarithromycin, cycloSPORINE, diazepam, irinotecan, midazolam, pimozide, sildenafil, sirolimus, tacrolimus, triazolam, warfarin: increased levels resulting in toxicity
Didanosine, efavirenz, rifampin: decreased atazanavir levels
Indinavir: increased hyperbilirubinemia
Ritonavir, telaprevir: decreased telaprevir levels when used with atazanavir and ritonavir

### Drug classifications

Antacids, $H_2$-receptor antagonists, proton pump inhibitors, CYP3A4 inducers: decreased atazanavir levels

Antidepressants (tricyclics), antidysrhythmics, ergots, calcium channel blockers, HMG-CoA reductase inhibitors, immunosuppressants, other protease inhibitors: increased levels resulting in increased toxicity

Contraceptives (oral), estrogens: increased effects (unboosted), decreased (boosted with ritonavir) CYP3A4 substrates, CYP3A4 inhibitors: increased atazanavir levels

### Drug/herb

Red yeast rice: myopathy, rhabdomyolysis
St. John's wort: decreased atazanavir levels, avoid concurrent use

### Drug/lab test

Increased: AST, ALT, total bilirubin, amylase, lipase, CK
Decreased: Hgb, neutrophils, platelets

### Drug/food

Increased: drug bioavailability (to be taken with food)

## NURSING CONSIDERATIONS

### Assessment

- **Assess for hepatic failure; hepatic studies:** ALT, AST, bilirubin
- Assess for lactic acidosis, hyperbilirubinemia (females, pregnancy, obesity)
- Monitor PR interval in those taking calcium channel blockers, digoxin
- Assess for signs of infection, anemia, nephrolithiasis
- Monitor bowel pattern before, during treatment; if severe abdominal pain with bleeding occurs, product should be discontinued; monitor hydration
- Monitor viral load, CD4 count throughout treatment
- **Serious rash (Stevens-Johnson syndrome, DRESS):** most rashes last 1-4 wk; if serious, discontinue product
- **Immune reconstitution syndrome:** when given with combination antiretroviral therapy, time of onset is variable

### Patient/family education

- Advise to take as prescribed with other antiretrovirals as prescribed; if dose is missed, take as soon as remembered up to 1 hr before next dose; do not double dose; do not share with others
- Teach that product must be taken daily to maintain blood levels for duration of therapy
- Advise patient to report yellowing of skin, sclera
- Instruct to notify prescriber if diarrhea, nausea, vomiting, rash occur; dizziness, lightheadedness; ECG may be altered
- Inform that product interacts with many products and St. John's wort; advise prescriber of all products, herbal products used
- Advise that redistribution of body fat may occur; the effect is not known
- Teach that product does not cure HIV-1 infection or prevent transmission to others, only controls symptoms

• Advise that if taking sildenafil or other phosphodiesterase type 5 inhibitors with atazanavir, there may be an increased risk of phosphodiesterase type 5 inhibitor-associated adverse events, including hypotension and prolonged penile erection; notify physician promptly of these symptoms

### Evaluation

**Positive therapeutic outcome**

• Increasing CD4 counts; decreased viral load, resolution of symptoms of HIV-1 infection

**⚠ HIGH ALERT**

## atenolol (Rx)

(a-ten'oh-lole)

**Tenormin, Tenolin** 🍁

*Func. class.:* Antihypertensive

*Chem. class.:* β-Blocker; $\beta_1$-, $\beta_2$-blocker (high doses)

**Do not confuse:** atenolol/albuterol/Altenol, Tenormin/thiamine/Imuran

**ACTION:** Competitively blocks stimulation of β-adrenergic receptor within vascular smooth muscle; produces negative chronotropic activity (decreases rate of SA node discharge, increases recovery time), slows conduction of AV node, decreases heart rate, negative inotropic activity, decreases $O_2$ consumption in myocardium; also decreases renin-aldosterone-angiotensin system at high doses, inhibits $\beta_2$-receptors in bronchial system at higher doses

**Therapeutic outcome:** Decreased B/P, heart rate, prevention of angina pectoris, MI

**USES:** Mild to moderate hypertension; prophylaxis of angina pectoris; suspected or known MI (**IV** use), MI prophylaxis, atrial fibrillation/flutter

## CONTRAINDICATIONS

Pregnancy, hypersensitivity to β-blockers, cardiogenic shock, 2nd- or 3rd-degree heart block, sinus bradycardia, cardiac failure

**Precautions:** Major surgery, breastfeeding, diabetes mellitus, renal disease, thyroid disease, HF, COPD, asthma, well-compensated heart failure, dialysis, myasthenia gravis, Raynaud's disease, pulmonary edema

**BLACK BOX WARNING:** Abrupt discontinuation, may precipitate angina, MI

## DOSAGE AND ROUTES

### Hypertension

**Adult:** PO 25-50 mg daily, increasing q1-2wk to 100 mg daily; may increase to 200 mg daily for angina or up to 100 mg for hypertension

**Child:** PO 0.8-1 mg/kg/dose initially, range 0.8-1.5 mg/kg/day, max 2 mg/kg/day

**Geriatric:** PO 25 mg/day initially

### Chronic stable angina

**Adult:** PO 50 mg q day, then 100 mg/day prn after 7 days, max 200 mg/day

### Post MI, MI prophylaxis

**Adult:** PO 1000 mg/day, in 1-2 divided doses, may need for 1-3 yr post MI

### Renal dose

**Adult:** PO CCr 15-35 ml/min, max 50 mg/day; CCr <15 ml/min max 25 mg/day; hemodialysis 25-50 mg after dialysis

**Available forms:** Tabs 25, 50, 100 mg

### Implementation

**PO route**

• Given before meals, at bedtime; tablet may be crushed or swallowed whole; give with food, same time of day to prevent GI upset; reduced dosage in renal dysfunction; take at same time each day

• Store protected from light, moisture; place in cool environment

## ADVERSE EFFECTS

**CNS:** *Insomnia, fatigue, dizziness, mental changes,* memory loss, hallucinations, depression, lethargy, drowsiness, strange dreams, catatonia

**CV:** Profound hypotension, bradycardia, HF, *cold extremities, postural hypotension, 2nd- or 3rd-degree heart block*

**ENDO:** Increased hypoglycemic response to insulin

**GI:** *Nausea, diarrhea,* vomiting, mesenteric arterial thrombosis, ischemic colitis

**GU:** Impotence, decreased libido

**HEMA:** Agranulocytosis, thrombocytopenia, purpura

**INTEG:** Rash, fever, alopecia

**RESP:** Bronchospasm, dyspnea, wheezing, pulmonary edema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 50%-60% (PO) |
| **Distribution** | Crosses placenta; protein binding (5%-15%) |
| **Metabolism** | Not metabolized |
| **Excretion** | Breast milk, kidneys (50%), feces (50%—unabsorbed product) |
| **Half-life** | 7 hr |

### Pharmacodynamics

| | PO |
|---|---|
| **Onset** | 1 hr |
| **Peak** | 2-4 hr |
| **Duration** | 24 hr |

## INTERACTIONS

### Individual drugs

Digoxin, diltiazem, hydrALAZINE, methyldopa, prazosin, reserpine, verapamil: increased hypotension, bradycardia

EPHEDrine, pseudoephedrine: increased hypertension

DOPamine, insulin, theophylline: decreased effect of each of these drugs

### Drug classifications

Aluminum antacids, NSAIDs, penicillins, salicylates: decreased atenolol effect

Amphetamines: increased hypertension

Anticholinergics, antihypertensives: cardiac glycosides, calcium channel blockers: increased hypotension, bradycardia, monitor and adjust dose if needed

Antidiabetic agents (oral) MAOIs: decreased effect of each of these drugs

Sympathomimetics (cough, cold preparations): mutual inhibition

### Drug/herb

Hawthorn: increased atenolol effect

Ephedra (ma huang): decreased atenolol effect

### Drug/lab test

Increased: uric acid, potassium, triglyceride, blood, BUN, ANA titer, platelets, alkaline phosphatase, creatinine, LDH, AST/ALT

Decreased: glucose

## NURSING CONSIDERATIONS

### Assessment

- Monitor **hypertension,** B/P during beginning treatment, periodically thereafter; pulse q4hr; note rate, rhythm, quality: apical/radial pulse before administration; notify prescriber of any significant changes (pulse <50 bpm); ECG
- Hypotension: may be caused in hemodialysis
- Hypoglycemia: may be masked in diabetes mellitus
- Check for baselines in renal, liver function tests before therapy begins
- Assess for edema in feet, legs daily; monitor I&O, daily weight; check for jugular vein distention, crackles bilaterally, dyspnea (HF)
- **Pregnancy/breastfeeding:** Do not use in pregnancy/breastfeeding

### Patient/family education

**BLACK BOX WARNING:** Teach patient not to discontinue product abruptly; taper over 2 wk (angina) as directed, **may precipitate angina, MI,** if stopped abruptly; take at same time each day

- Teach patient not to use OTC products containing α-adrenergic stimulants (such as nasal decongestants, OTC cold preparations); to limit alcohol, smoking; to limit sodium intake as prescribed
- Teach patient how to take pulse and B/P at home; advise when to notify prescriber (<60 bpm)
- Instruct patient to comply with weight control, dietary adjustments, modified exercise program
- Advise patient to carry/wear emergency ID for products, allergies, conditions being treated; tell patient product controls symptoms but does not cure
- Caution patient to avoid hazardous activities if dizziness, drowsiness is present
- Teach patient to report symptoms of HF: difficult breathing, especially on exertion or when lying down, night cough, swelling of extremities or bradycardia, dizziness, confusion, depression, fever
- Teach patient to take product as prescribed, not to double doses, skip doses; take any missed doses as remembered if at least 6 hr until next dose
- Advise to change position slowly
- Advise patient that product may mask symptoms of hypoglycemia in diabetic patients
- Advise patient to use contraception while taking this product, do not use in pregnancy, breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P in hypertension (after 1-2 wk)
- Absence of dysrhythmias
- Absence of MI
- Decreased angina/pain
- Increased activity tolerance

## TREATMENT OF OVERDOSE:

Lavage, **IV** atropine for bradycardia, **IV** theophylline for bronchospasm, digoxin, $O_2$, diuretic for cardiac failure, hemodialysis, **IV** glucose for hyperglycemia, **IV** diazepam (or phenytoin) for seizures

A

⚠ HIGH ALERT

RARELY USED

## atezolizumab

(a-te-zoe-liz′ue-mab)

**Tecentriq**

*Func. class.:* Antineoplastic

**USES:** Treatment of locally advanced or metastatic urothelial carcinoma, including bladder cancer and other urinary system cancers, in patients who progress during or after platinum-containing chemotherapy for advanced disease, or within 12 months of neoadjuvant or adjuvant platinum-containing chemotherapy

### CONTRAINDICATIONS

Hypersensitivity

### DOSAGE AND ROUTES

**Adult: IV** INF 1200 mg over 60 min q3wk until disease progression or unacceptable toxicity. If the first infusion is tolerated, infusions may be given over 30 min

## atomoxetine (Rx)

(at-o-mox′eh-teen)

**Strattera**

*Func. class.:* Psychotherapeutic—miscellaneous

**ACTION:** A selective norepinephrine reuptake inhibitor; may inhibit the presynaptic norepinephrine transporter; exact mechanism of action is unknown

**Therapeutic outcome:** Decreased hyperactivity, impulsivity, increased attention, organization, ability to complete tasks

**USES:** Attention deficit hyperactivity disorder

### CONTRAINDICATIONS

Hypersensitivity, closed-angle glaucoma, MAOI therapy, history of pheochromocytoma

**Precautions:** Pregnancy, breastfeeding, hypertension, hepatic disease, angioedema, bipolar disorder, dysrhythmias, CAD, hypo/hypertension, arteriosclerosis, cardiac disease, cardiomyopathy, heart failure, jaundice

**BLACK BOX WARNING:** Children <6 yr, suicidal ideation

### DOSAGE AND ROUTES

**ADHD**

**Child ≤70 kg, and <6 yr:** PO 0.5 mg/kg/day, increase after 3 days to a target daily dose of 1.2 mg/kg in AM or evenly divided doses AM, late afternoon; max 1.4 mg/kg/day or 100 mg daily, whichever is less

**Adult and child >6 yr and >70 kg:** PO 40 mg daily, increase after 3 days to a target daily dose of 80 mg in AM or evenly divided doses AM, late afternoon; max 100 mg daily

**Initial dosage titration with strong CYP2D6 inhibitors**

**Adult and child >6 yr weighing >70 kg:** PO 40 mg/day each AM or 2 evenly divided doses, titrate to target of 80 mg/day if symptoms do not improve after 4 wk and dose is well tolerated

**Hepatic dose**

Child-Pugh B: reduce dose by 50%
Child-Pugh C: reduce dose by 75%

**Available forms:** Caps 10, 18, 25, 40, 60, 80, 100 mg

**Implementation**

- Swallow whole; do not break, crush, or chew
- Give without regard to food
- Provide gum, hard candy, frequent sips of water for dry mouth

### ADVERSE EFFECTS

**CNS:** *Insomnia,* dizziness, headache, irritability, crying, mood swings, fatigue, hypoesthesia, lethargy, paresthesia
**CV:** *Palpitations,* hot flushes, tachycardia, increased B/P
**ENDO:** Growth retardation
**GI:** Dyspepsia, nausea, anorexia, dry mouth, weight loss, vomiting, diarrhea, constipation, hepatic injury
**GU:** Urinary hesitancy, retention, dysmenorrhea, erectile disturbance, ejaculation failure, impotence, prostatitis, abnormal orgasm, male pelvic pain
**INTEG:** Exfoliative dermatitis, sweating, rash
**MISC:** Cough, rhinorrhea, dermatitis, ear infection, rhabdomyolysis

**Pharmacokinetics**

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding, 98% |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | Unknown, half-life 5 hr |

**Pharmacodynamics**

Unknown

### INTERACTIONS

**Individual drug**

Albuterol: increased cardiovascular effects

### Drug classifications

CYP2D6 inhibitors (amiodarone, cimetidine [weak], citalopram, clomiPRAMINE, delavirdine, escitalopram, FLUoxetine, gefitinib, imatinib, PARoxetine, propafenone, quiNIDine [potent], ritonavir, sertraline, thioridazine, venlafaxine): increased effects of atomoxetine
Increase: B/P pressor agents
MAOIs or within 14 days of MAOIs, vasopressors: hypertensive crisis
Increase: QT prolongation, torsade de pointes dofetilide, grepafloxacin, mesoridazine, pimozide, probucol, sparfloxacin, ziprasidone
Pressor agents: increased cardiovascular effects

## NURSING CONSIDERATIONS

### Assessment

- Monitor VS, B/P; check patients with cardiac disease more often for increased B/P
- **Hepatic injury:** may cause liver failure: monitor LFT; assess for jaundice, pruritus, flu-like symptoms, upper right quadrant pain

**BLACK BOX WARNING:** Assess mental status: mood, sensorium, affect, stimulation, insomnia, aggressiveness, suicidal ideation in children/young adults

- Assess appetite, sleep, speech patterns
- Assess for attention span, decreased hyperactivity in ADHD persons, growth rate, weight; therapy may need to be discontinued
- Priapism: Monitor for urinary function (hesitancy, retention, sexual changes)
- Pregnancy/breastfeeding: Identify if pregnancy is planned or suspected, or if breastfeeding, use only if benefits outweigh fetal risk

### Patient/family education

- Advise patient to avoid OTC preparations, other medications, herbs, supplements unless approved by prescriber, no tapering needed when discontinuing product
- Advise patient to avoid alcohol ingestion
- Advise patient to avoid hazardous activities until stabilized on medication
- Advise patient to get needed rest; patients will feel more tired at end of day; do not take dose late in day, insomnia may occur

**BLACK BOX WARNING:** Advise to report suicidal ideation

- Teach patient to notify prescriber immediately if erection >4 hr
- To report immediately, fatigue, chest pain, difficulty breathing
- **Pregnancy/breastfeeding:** Teach patient to notify provider if pregnancy is planned or suspected, avoid use in pregnancy, breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Decreased hyperactivity (ADHD)

## atorvastatin (Rx)

(a-tore'va-stat-in)
**Lipitor**
*Func. class.:* Antilipidemic
*Chem. class.:* HMG-CoA reductase inhibitor

**Do not confuse:** atorvastatin/atomoxetine, Lipitor/Loniten/ZyrTEC

**ACTION:** Inhibits HMG-CoA reductase enzyme, which reduces cholesterol synthesis, high doses lead to plaque regression

**Therapeutic outcome:** Decreased cholesterol levels and LDLs, increased HDLs

**USES:** As an adjunct in primary hypercholesterolemia (types Ia, Ib), dysbetalipoproteinemia, elevated triglyceride levels; prevention of cardiovascular disease by reduction of heart risk in those with mildly elevated cholesterol

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity, active liver disease

**Precautions:** Past liver disease, alcoholism, severe acute infections, trauma, severe metabolic disorders, electrolyte imbalance

## DOSAGE AND ROUTES

**Adult:** PO 10-20 mg daily, usual range 10-80 mg, dosage adjustments may be made in 2-4 wk intervals, max 80 mg/day; patients requiring >45% reduction in LDL may be started at 40 mg daily

### Heterozygous familial hypercholesterolemia

**Child 10-17 yr:** PO 10 mg q day, adjust q4 wk, max 20 mg/day

**Available forms:** Tabs 10, 20, 40, 80 mg

### Implementation

- Administer total daily dose at any time of day
- Store in cool environment in airtight, light-resistant container

## ADVERSE EFFECTS

**CNS:** Headache, asthenia, insomnia
**EENT:** Lens opacities
**GI:** *Abdominal cramps, constipation, diarrhea, heartburn,* nausea, dyspepsia, *flatus,* liver dysfunction, pancreatitis, increased serum transaminase
**GU:** Impotence, urinary tract infection

**INTEG:** Rash, pruritus, alopecia, photosensitivity (rare)
**MISC:** Hypersensitivity; gynecomastia (child)
**MS:** Myalgia, rhabdomyolysis, arthralgia, myositis
**RESP:** Pharyngitis, sinusitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Bile, feces, kidneys |
| **Half-life** | 14 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Amiodarone, boceprevir, nelfinavir, lopinavir/ritonavir
Clofibrate, cycloSPORINE, gemfibrozil, niacin: increased risk of rhabdomyolysis, use lower dose
Colestipol: decreased action of atorvastatin, myopathy
Digoxin: increased action of digoxin CYP3A4 inhibitors, monitor digoxin levels often
Erythromycin: increased levels of atorvastatin
Warfarin: increased action of warfarin

### Drug classifications

Antifungals (azole): possible rhabdomyolysis
Contraceptives (oral): increased levels

### Drug/herb

St. John's wort: decreased effect

### Drug/food

Grapefruit juice: possible toxicity
Oat bran may reduce effectiveness

### Drug/lab test

Increased: ALT, AST, CK
Interference: thyroid function tests

## NURSING CONSIDERATIONS

### Assessment

- **Hypercholesterolemia:** assess nutrition: fat, protein, carbohydrates; nutritional analysis should be completed by dietitian before treatment; assess for muscle pain, tenderness; obtain CPK if these occur, product may need to be discontinued; monitor triglycerides, cholesterol at baseline and throughout treatment; LDL and VLDL should be watched closely; if increased, product should be discontinued
- Monitor bowel pattern daily; diarrhea may be a problem
- Monitor liver function studies q1-2mo during the first 1½ yr of treatment; AST, ALT, liver function tests may be increased
- Monitor renal studies in patients with compromised renal system: BUN, I&O ratio, creatinine
- Assess eyes via ophthalmic exam 1 mo after treatment begins, annually
- **Rhabdomyolysis:** Assess for muscle pain, tenderness, obtain CPK baseline, if markedly increased, product may need to be discontinued, many drug interactions make the possibility of rhabdomyolysis greater
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, do not breastfeed or use in pregnancy

### Patient/family education

- Inform patient that compliance is needed for positive results to occur, not to double doses
- Teach patient that risk factors should be decreased: high-fat diet, smoking, avoid alcohol consumption, absence of exercise
- Advise patient to notify prescriber if the GI symptoms of diarrhea, abdominal or epigastric pain, nausea, vomiting; chills, fever, sore throat; muscle pain, weakness occur
- Advise patient that treatment will take several years
- Advise patient that blood work and eye exam will be necessary during treatment
- Advise not to take if pregnant or breastfeeding
- Advise patient to stay out of the sun, use protective clothing, or use sunscreen to prevent photosensitivity (rare)

### Evaluation

**Positive therapeutic outcome**

- Decreased cholesterol levels, serum triglyceride
- Improved HDL:LDL ratio

## atovaquone (Rx)

(a-toe'va-kwon)
**Mepron**
*Func. class.:* Antiprotozoal
*Chem. class.:* Analog of ubiquinone

**ACTION:** Interferes with DNA/RNA synthesis in protozoa

**Therapeutic outcome:** Antiprotozoal for *Pneumocystis jiroveci* only

**USES:** *P. jiroveci* infections in patients intolerant of trimethoprim/sulfamethoxazole (cotrimoxazole), prophylaxis, *Toxoplasma gondii,* toxoplasmosis

## CONTRAINDICATIONS

Hypersensitivity or history of developing life-threatening allergic reactions to any component of the formulation, benzyl alcohol sensitivity

**Precautions:** Pregnancy, breastfeeding, GI/hepatic disease, neonates, respiratory insufficiency

## DOSAGE AND ROUTES

### Acute, mild, moderate *Pneumocystis jiroveci* pneumonia (PCP)

**Adult and adolescent 13-16 yr:** PO 750 mg tid with food for 21 days

### *Pneumocystis jiroveci* pneumonia prophylaxis

**Adult and adolescent:** PO 1500 mg daily with meal

**Available forms:** Susp 750 mg/5 ml

### Implementation

- Give with food (preferably fatty); to increase absorption of the product and higher plasma concentrations; give tid × 3 wk
- Give oral suspension after shaken
- Take all contents of foil pouch

## ADVERSE EFFECTS

**CNS:** *Dizziness, headache, anxiety,* insomnia, asthenia, fever
**CV:** Hypotension
**GI:** *Nausea, vomiting, diarrhea,* anorexia, increased AST and ALT, acute pancreatitis, constipation, abdominal pain
**HEMA:** Anemia, neutropenia
**INTEG:** Pruritus, urticaria, *rash*
**META:** Hypoglycemia, hyponatremia
**OTHER:** Cough, dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Poor; increased when taken with fatty foods |
| **Distribution** | Unknown |
| **Metabolism** | Hepatic recycling |
| **Excretion** | Feces, unchanged (94%) |
| **Half-life** | 2-3 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-8 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Metoclopramide, Rifampin, rifabutin, tetracycline: decreased effectiveness of atovaquone, avoid concurrent use
Zidovudine: increased level of zidovudine, monitor for toxicity

### Drug/lab test

Increase: AST, ALT, alk phos
Decrease: glucose, neutrophils, Hgb, sodium

## NURSING CONSIDERATIONS

### Assessment

- Assess for ***Pneumocystis jiroveci:*** monitor WBC, bilateral lung sounds, sputum for C&S; these should be checked before, periodically during, after treatment; after collection of 1st sputum, therapy may begin
- Monitor for signs of **infection;** anemia; monitor bowel pattern before, during treatment
- Monitor respiratory status: rate, character, wheezing, dyspnea; ABGs, chest films
- Assess for dizziness, confusion, hallucination
- Assess for allergies before treatment, reaction of each medication; place allergies on chart; notify all people giving products
- Pregnancy/breastfeeding: Identify if pregnancy is planned or suspected, use only if benefits outweigh fetal risk, cautious use in breastfeeding

### Patient/family education

- Instruct patient to take with food, preferably fatty foods, to increase plasma concentrations
- Advise patient to take product exactly as prescribed

### Evaluation

**Positive therapeutic outcome**

- Decreased temperature
- Ability to breathe
- Three negative sputum cultures

## atropine (Rx)

(a'troe-peen)
*Func. class.:* Antidysrhythmic, anticholinergic parasympatholytic, antimuscarinic
*Chem. class.:* Belladonna alkaloid

**Do not confuse:** atropine/Akarpine

**ACTION:** Blocks acetylcholine at parasympathetic neuroeffector sites; increases cardiac output, heart rate by blocking vagal stimulation in heart; dries secretions by blocking vagus

**Therapeutic outcome:** Drying of secretions, increased heart rate, cycloplegia, mydriasis

**USES:** Bradycardia <40-50 bpm, bradydysrhythmia, reversal of anticholinesterase agents, insecticide poisoning, blocking cardiac vagal reflexes, decreasing secretions before surgery, antispasmodic with GU and biliary surgery, bronchodilator, AV heart block, irinotecan-induced diarrhea, rapid-sequence intubation

## CONTRAINDICATIONS

Hypersensitivity to belladonna alkaloids, closed-angle glaucoma, GI obstructions, myasthenia gravis, thyrotoxicosis, ulcerative colitis, prostatic hypertrophy, tachycardia/tachydysrhythmias, asthma, acute hemorrhage, severe hepatic disease, myocardial ischemia, paralytic ileus

**Precautions:** Pregnancy, breastfeeding, child <6 yr, geriatric, renal disease, HF, hyperthyroidism, COPD, hypertension, intraabdominal infections, Down syndrome, spastic paralysis, gastric ulcer

## DOSAGE AND ROUTES

### Bradycardia/bradydysrhythmias

**Adult:** **IV** bol 0.5-1 mg given q3-5min, not to exceed 2 mg

**Child:** **IV** 0.02 mg/kg, may repeat X1, min dose 0.1 mg to avoid paradoxical reaction, max single dose 0.5 mg, max total dose 1 mg

### Organophosphate poisoning

**Adult and child:** IM (AtroPen)/**IV** 1-2 mg q 20-30 min until muscarinic symptoms disappear; may need 6 mg qhr

**Adult and child ≥90 lb, usually >10 yr:** 2 mg IM (AtroPen)

**Child 40-90 lb, usually 4-10 yr:** 1 mg IM (AtroPen)

**Child 15-40 lb, 6 mo-4 yr:** 0.5 mg IM (AtroPen)

**Infant <15 lb:** IM/**IV** 0.05 mg/kg q5-20min

### Presurgery

**Adult and child >20 kg:** SUBCUT/IM/ **IV** 0.4-0.6 mg 30-60 min before anesthesia

**Child <20 kg:** IM/SUBCUT 0.01 mg/kg up to 0.4 mg ½-1 hr preop, max 0.6 mg/dose

**Available forms:** Inj 0.05, 0.1, 0.4, 0.8, 1 mg/ml; inj prefilled autoinjectors (AtroPen) 0.25, 0.5, 1, 2 mg

### Implementation

**IM route**

• Expect atropine flush 15-20 min after inj; it may occur in children and is not harmful

**AtroPen**

• Use no more than 3 AtroPen injections unless under the supervision of trained provider

• Use as soon as symptoms appear (tearing, wheezing, muscle fasciculations, excessive oral secretions), may use through clothing

**IV route**

• Give **IV** undiluted or diluted with 10 ml sterile water; give at a rate of 0.6 mg/min; give through Y-tube or 3-way stopcock; do not add to **IV** sol; may cause paradoxical bradycardia lasting 2 min

**Y-site compatibilities:** Amrinone, etomidate, famotidine, heparin, hydrocortisone sodium succinate, meropenem, nafcillin, potassium chloride, SUFentanil, vit B/C

## ADVERSE EFFECTS

**CNS:** Headache, dizziness, involuntary movement, confusion, psychosis, anxiety, coma, flushing, drowsiness, insomnia, weakness, delirium (geriatric)

**CV:** Hypo/hypertension, paradoxical bradycardia, angina, PVCs, tachycardia, ectopic ventricular beats, bradycardia, palpitations

**EENT:** Blurred vision, photophobia, glaucoma, eye pain, pupil dilatation, nasal congestion, increased intraoccular pressure

**GI:** Dry mouth, nausea, vomiting, abdominal pain, anorexia, constipation, paralytic ileus, abdominal distention, altered taste

**GU:** Retention, hesitancy, impotence, dysuria

**INTEG:** Rash, urticaria, contact dermatitis, dry skin, flushing

**MISC:** Suppression of breastfeeding, decreased sweating, anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO, SUBCUT, IM) |
| **Distribution** | Crosses blood-brain barrier, placenta |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, unchanged (70%-90%); breast milk |
| **Half-life** | 13-40 hr |

### Pharmacodynamics

| | IM/ SUBCUT | IV | Ophth |
|---|---|---|---|
| **Onset** | 15 min | 2-4 min | ½ hr |
| **Peak** | 30 min | 2-4 min | 30-60 min |
| **Duration** | 4-6 hr | 4-6 hr | 1-2 wk |

## INTERACTIONS

### Individual drugs

Amantadine: increased anticholinergic effects

Ketoconazole, levodopa: decreased absorption

Potassium chloride (oral): increased mucosal lesions, avoid concurrent use

### Drug classifications

Antacids: decreased absorption of atropine

Antidepressants (tricyclic), antiparkinson agents, phenothiazines, antidysrhythmics: increased anticholinergic effect

## NURSING CONSIDERATIONS

### Assessment

- Monitor I&O ratio; check for urinary retention and daily output in geriatric or postoperative patients
- Monitor ECG for ectopic ventricular beats, PVC, tachycardia in cardiac patients
- Monitor for bowel sounds; check for constipation; abdominal distention and constipation may occur
- Monitor respiratory status: rate, rhythm, cyanosis, wheezing, dyspnea, engorged neck veins
- Monitor cardiac rate: rhythm, character, B/P continuously
- Monitor allergic reaction: rash, urticaria
- Beers: Avoid in older adults, highly anticholinergic, high risk of delirium, in men decreases urinary flow
- Pregnancy/breastfeeding: Identify if pregnancy is planned or suspected, use only if benefits outweigh fetal risk

### Patient/family education

- Advise patient not to perform strenuous activity in high temperatures; heat stroke may result
- Instruct patient to take as prescribed; not to skip doses
- Instruct patient to report change in vision; blurring or loss of sight; trouble breathing; sweating; flushing, chest pain, allergic reactions, constipation, urinary retention, to use sunglasses to protect the eyes
- Caution patient not to operate machinery if drowsiness occurs
- Advise patient not to take OTC products without approval of physician
- Teach patient not to freeze or expose to light (Astropen)

### Evaluation

**Positive therapeutic outcome**

- Decreased dysrhythmias
- Increased heart rate
- Decreased secretions, GI, GU spasms
- Bronchodilatation

## TREATMENT OF OVERDOSE:

$O_2$, artificial ventilation, ECG; administer DOPamine for circulatory depression; administer diazepam or thiopental for seizure; assess need for antidysrhythmics

**atropine ophthalmic**
*See Appendix B*

**⚠ HIGH ALERT**

# axitinib

**Inlyta**

*Func. class.:* Antineoplastic, biologic response modifier, signal transduction inhibitor (STI)

*Chem. class.:* Tyrosine kinase inhibitor

**ACTION:** Inhibits receptor tyrosine kinases including vascular endothelial growth factor receptors (VEGFR)-1, VEGFR-2, and VEGFR-3; inhibits tumor growth and phosphorylation of VEGFR-2 and VEGF-mediated endothelial cell proliferation

**Therapeutic outcome:** Decreased spread of malignancy

**USES:** Treatment of advanced renal cell cancer after failure of one prior systemic therapy

## CONTRAINDICATIONS

Pregnancy, breastfeeding

**Precautions:** Risk for or history of thromboembolic disease, recent bleeding, untreated brain metastasis, recent GI bleeding, GI perforation, fistula, surgery, moderate hepatic disease, uncontrolled hypertension, hyper/hypothyroidism, proteinuria, infertility, end-stage renal disease (CrCl $<$15 ml/min); not intended for use in adolescents, children, infants, neonates

## DOSAGE AND ROUTES

**Adult: PO** 5 mg bid (at 12 hr intervals), may increase to 7 mg bid and then to 10 mg bid in those not receiving antihypertensives who tolerate the lower dosage for at least 2 consecutive wk with no more than grade 2 adverse reactions. Reduce to 3 mg bid if a dose reduction is needed; if further reduction is necessary, reduce to 2 mg bid

**Adult receiving a strong CYP 3A4/5 inhibitor:** Reduce dose by 1/2, adjust as needed

**Available forms:** Tab 1, 5 mg

### Implementation

- Give with or without food; swallow tablet whole with a glass of water
- If patient vomits or misses a dose, an additional dose should not be taken; the next dose should be taken at the usual time
- Store at room temperature

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, reversible posterior leukoencephalopathy syndrome (RPLS), fatigue

**CV:** Hypertension, arterial thromboembolic events (ATE), venous thromboembolic events (VTE)

**ENDO:** Hypothyroidism, hyperthyroidism
**GI:** Lower GI bleeding/perforation/fistula. abdominal pain, constipation, diarrhea, dysgeusia, dyspepsia, dysphonia, hemorrhoids, nausea, mucosal inflammation, stomatitis, vomiting, increased ALT/AST
**GU:** Proteinuria
**HEMA:** Bleeding, intracranial bleeding, anemia, polycythemia, decreased/increased hemoglobin, lymphopenia, thrombocytopenia, neutropenia
**INTEG:** Palmar-plantar erythrodysesthesia (hand and foot syndrome), rash, dry skin, pruritus, alopecia, erythema
**MISC:** Weight loss dehydration metabolic and electrolyte laboratory abnormalities included
**MS:** Asthenia, arthralgia, musculoskeletal pain, myalgia
**RESP:** Cough, dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding >99% |
| **Metabolism** | Liver |
| **Excretion** | Unknown |
| **Half-life** | 2.5-6.1 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

CYP3A4/5 inhibitor, strong, moderate (ketoconazole, boceprevir, chloramphenicol, conivaptan, delavirdine, fosamprenavir, imatinib, indinavir, isoniazid, itraconazole, dalfopristin; quinupristin, posaconazole, ritonavir, telithromycin, tipranavir [boosted with ritonavir], darunavir [boosted with ritonavir], aldesleukin, IL-2, amiodarone, aprepitant, fosaprepitant atazanavir, bromocriptine, clarithromycin, crizotinib, danazol, diltiazem, dronedarone, erythromycin, fluvoxaMINE, lanreotide, lapatinib, miconazole, mifepristone, nefazodone, nelfinavir, niCARdipine, octreotide, pantoprazole, saquinavir, tamoxifen, verapamil, voriconazole, grapefruit juice): increased axitinib effect, avoid using together or reduce axitinib dose
CYP3A4/5 inducers, strong/moderate (rifampin, carBAMazepine, dexamethasone, phenytoin, PHENobarbital, rifabutin, rifapentine, St. John's wort, ethanol, bexarotene, bosentan, efavirenz, etravirine, griseofulvin, metyrapone, modafinil, nafcillin, nevirapine, OXcarbazepine, vemurafenib, pioglitazone, topiramate): decreased effect of axitinib, avoid using together
CYP3A4/5 inhibitor and inducers (quiNINE): increased or decreased axitinib effect

### Drug/lab test

Increase: creatinine, lipase, amylase, potassium
Decrease: bicarbonate, calcium, albumin, glucose, phosphate, sodium
Increase or decrease: sodium, glucose

### Drug/food

Increase drug effect: grapefruit or grapefruit juice

### Drug/herb

St. John's wort: decreased effect of axitinib

## NURSING CONSIDERATIONS

### Assessment

- Bleeding: monitor for GI bleeding or perforation; temporarily discontinue therapy if a patient develops any bleeding that requires treatment
- Surgery: discontinue ≥24 hr before surgery, may be resumed after adequate wound healing
- Hepatic/renal disease: dosage should be reduced in patients with moderate (Child-Pugh Class B) hepatic disease, monitor liver function tests (ALT, AST, bilirubin) before and periodically during therapy; monitor CCr before and during treatment
- Hypertension: B/P should be well controlled before starting treatment; monitor patients for hypertension and administer antihypertensive therapy as needed before and during therapy; dose should be reduced for persistent hypertension; therapy should be discontinued if B/P remains elevated after a dosage reduction or if there is evidence of hypertensive crisis; after discontinuation monitor B/P for hypotension in those receiving antihypertensives
- Hyper/hypothyroidism: monitor thyroid function tests before and periodically during therapy; thyroid disease should be treated with thyroid medications
- Monitor for proteinuria before and periodically during therapy; product may need to be decreased or discontinued if moderate to severe proteinuria occurs
- **Pregnancy/breastfeeding:** determine if the patient is pregnant or breastfeeding before using this product; may also cause infertility, do not use in pregnancy or breastfeeding

### Patient/family education

- Instruct patient to use contraception during treatment or to avoid use of this product;

to notify prescriber if pregnancy is planned or suspected, not to breastfeed
• Instruct patient to notify prescriber of bleeding that is severe or that requires treatment
• Teach patient that product will be discontinued ≥24 hr before surgery; may be resumed after adequate wound healing
• Teach patient that laboratory testing will be required before and periodically during product use
• Teach patient how to monitor B/P and that B/P products should be continued as directed by prescriber

### Evaluation

**Positive therapeutic outcome**
• Decreased spread of malignancy

**⚠ HIGH ALERT**

## azaCITIDine (Rx)

(a-za-sie-ti′deen)
**Vidaza**
*Func. class.:* Antineoplastic hormone
*Chem. class.:* Pyrimidine nucleoside analogue

**Do not confuse:** azaCITIDine/ azaTHIOprine

**ACTION:** Cytotoxic by producing damage to double-strand DNA during DNA synthesis

**Therapeutic outcome:** Improved blood counts in refractor anemia

**USES:** Myelodysplastic syndrome (MDS)

## CONTRAINDICATIONS

Pregnancy, hypersensitivity to this product or mannitol, advanced malignant hepatic tumors

**Precautions:** Breastfeeding, children, geriatric, renal/hepatic disease; baseline albumin <30 g/L; a man should not father a child while taking this product

## DOSAGE AND ROUTES

**Adult:** SUBCUT 75 mg/m² daily × 7 days, q4wk, premedicate with antiemetic; dose may be increased to 100 mg/m² if no response is seen after 2 treatment cycles; minimum treatment 4 cycles

**Available forms:** Powder for inj, 100 mg

### Implementation

• Increase patient's fluid intake to 2-3 L/day to prevent dehydration, unless contraindicated
• Assist patient with rinsing of mouth tid-qid with water, club soda; brushing of teeth bid-tid with soft brush or cotton-tipped applicator for stomatitis; use unwaxed dental floss
• Provide a nutritious diet with iron, vitamin supplement, low fiber, few dairy products
• Use cytotoxic handling procedures

**SUBCUT route**
• **Reconstitute** with 4 ml sterile water for inj (25 mg/ml), **inject** diluents slowly into vial, **invert** vial 2-3 times and gently rotate; sol will be cloudy, use immediately; divide doses >4 ml into two syringes; invert the contents 2-3 times and gently roll syringe between the palms for 30 sec immediately before administration; rotate inj site

**IV intermittent INF route**
• **Reconstitute** each vial with 4 ml sterile water for inj, **shake** well until all solids are dissolved, (10 mg/ml) withdraw sol and **inject** in 50-100 NS or LR, **infuse** over 10-40 min

## ADVERSE EFFECTS

**CNS:** Anxiety, depression, dizziness, fatigue, headache, fever, insomnia
**CV:** Cardiac murmur, hypotension, tachycardia, peripheral edema, chest pain
**GI:** Diarrhea, nausea, vomiting, anorexia, constipation, abdominal pain, distention, tenderness, hemorrhoids, mouth hemorrhage, tongue ulceration, stomatitis, dyspepsia, hepatotoxicity, hepatic coma
**GU:** Real failure, renal tubular acidosis, dysuria, UTI
**HEMA:** Leukopenia, anemia, thrombocytopenia, neutropenia, ecchymosis, febrile neutropenia, petechiae
**INTEG:** Irritation at site, rash, sweating, pyrexia, pruritus
**META:** Hypokalemia
**MS:** Weakness, arthralgia, muscle cramps, myalgia, back pain
**RESP:** Cough, dyspnea, pharyngitis, pleural effusion

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Urine |
| **Half-life** | 35-49 min |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | ½ hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Antineoplastics, other: increased bone marrow suppression
Increase: bleeding, anticoagulants

### Drug/lab
Increase: BUN/creatinine
Decrease: WBC, platelets, neutrophils, potassium

## NURSING CONSIDERATIONS
### Assessment
- Assess for CNS symptoms: fever, headache, chills, dizziness
- Monitor bone marrow suppression with patients with baseline WBC $3 \times 10^9$/L, absolute neutrophil count (ANC) $= 1.5 \times 10^9$/L, and platelets $= 75 \times 10^9$/L, adjust dose; ANC $< 0.5 \times 10^9$/L, platelets $< 25 \times 10^9$/L, give 50% dose next course; ANC 0.5-1.5 $\times$ $10^9$/L, platelets 25-50 $\times$ $10^9$/L, give 67% next course
- Assess buccal cavity q8hr for dryness, sores, or ulceration, white patches, oral pain, bleeding, dysphagia
- Assess for bruising, bleeding, blood in stools, urine, sputum, emesis; myelodysplastic syndrome (MDS), splenomegaly

### Patient/family education
- Instruct patient to avoid foods with citric acid or hot or rough texture if stomatitis is present; to drink adequate fluids
- Instruct patient to report stomatitis; any bleeding, white spots, ulcerations in mouth; tell patient to examine mouth daily, report symptoms
- Instruct patient to avoid crowds, persons with known infections; not to receive immunizations
- Advise patient to use contraception during and for several months after therapy, pregnancy D not to breastfeed, not to father a child while receiving this product

### Evaluation
**Positive therapeutic outcome**
- Improvement in blood counts in refractory anemia, or refractory anemia with excess blasts

## azaTHIOprine (Rx)
(ay-za-thye'oh-preen)
**Azasan, Imuran**
*Func. class.:* Immunosuppressant
*Chem. class.:* Purine antagonist

**Do not confuse:** azaTHIOprine/azaCITIDine

**ACTION:** Produces immunosuppression by inhibiting purine synthesis in cells

**Therapeutic outcome:** Absence of graft rejection, slowing of rheumatoid arthritis

**USES:** Renal transplants to prevent graft rejection, refractory rheumatoid arthritis

**Unlabeled uses:** Myasthenia gravis, chronic ulcerative colitis, Crohn's disease, Behçet's syndrome

## CONTRAINDICATIONS
Pregnancy, breastfeeding, hypersensitivity

**Precautions:** Severe renal/hepatic disease, geriatric, thiopurine methyltransferase deficiency, infection, bone marrow suppression, must be used by an experienced clinician

**BLACK BOX WARNING:** neoplastic disease

## DOSAGE AND ROUTES
### Prevention of rejection
**Adult and child:** **IV** 3-5 mg/kg/day, then maintenance (PO) of at least 1-3 mg/kg/day,

### Renal dose
**Adult:** PO; give lower dose in tubular necrosis in immediate postcadaveric transplant period, CCr 10-50 ml/min 75% of dose; CCr <10 ml/min 50% of dose

### Refractory rheumatoid arthritis
**Adult:** PO 1 mg/kg/day; may increase dosage after 2 mo by 0.5 mg/kg/day and then q4wk; not to exceed 2.5 mg/kg/day

### Idiopathic thrombocytopenia purpura (unlabeled)
**Adult:** PO 1-2 mg/kg/day X 3-6 mo max 150 mg/day

**Available forms:** Tabs 50, 75, 100 mg; inj **IV** 100 mg

### Implementation
**PO route**
- Give with meals to reduce GI upset; nausea is common

**IV route**
- Prepare in biological cabinet using gown, gloves, mask

**Direct, IV route**
- **Dilute** to 10 mg/ml with 0.9% NaCl, 0.45% NaCl, $D_5W$, **give** over 5 min

**Intermittent IV INF route**
- **Reconstitute** 100 mg/10 ml of sterile water for inj; rotate to dissolve; **further dilute** with 50 ml or more saline or glucose in saline, **give** over ½-1 hr

**Y-site compatibilities:** Alfentanil, atracurium, atropine, benztropine, calcium gluconate, cycloSPORINE, enalaprilat, epoetin alfa, erythromycin, fentaNYL, fluconazole, folic acid, furosemide, glycopyrrolate, heparin, insulin, mannitol, mechlorethamine, metoprolol, naloxone, nitroglycerin, oxytocin, penicillin G, potassium chloride, propranolol, protamine, SUFentanil, trimetaphan, vasopressin

**Solution compatibilities:** $D_5W$, NaCl 0.9%, NaCl 0.45%

## ADVERSE EFFECTS

**GI:** Nausea, vomiting, stomatitis, esophagitis, pancreatitis, hepatotoxicity, jaundice, hepatic veno-occlusive disease
**HEMA:** Leukopenia, thrombocytopenia, anemia, pancytopenia, bleeding
**INTEG:** Rash, alopecia
**MISC:** Raynaud's symptoms, serum sickness, secondary malignancy, infection
**MS:** Arthralgia, muscle wasting

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Readily (PO) |
| **Distribution** | Crosses placenta |
| **Metabolism** | Liver to mercaptopurine |
| **Excretion** | Kidney, minimal |
| **Half-life** | 3 hr |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | Unknown | Unknown |
| **Peak** | 4 hr | Unknown |
| **Duration** | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Do not admix with other products
Allopurinol: increased action of azaTHIOprine, use decreased dose of azaTHIOprine or avoid using
CycloSPORINE: increased myelosuppression
Sulfamethoxazole-trimethoprim: increased leukopenia
Warfarin: decreased action of warfarin

### Drug classifications

ACE inhibitors: increased leukopenia, monitor for increased leukopenia
Antineoplastics: increased myelosuppression, monitor for increased myelosupression
Toxoids, vaccines: decreased immune response

### Drug/lab test

Increased: liver function tests
Decreased: uric acid
Interference: CBC, diff count

## NURSING CONSIDERATIONS

### Assessment

- Assess symptoms of **rheumatoid arthritis:** pain in joints, stiffness, poor range of motion, mobility, inflammation before and during treatment
- Monitor **blood studies:** CBC, Hgb, WBC, platelets during treatment monthly; if leukocytes are $<3000/mm^3$ or platelets $<100{,}000/mm^3$, product should be discontinued or reduced; decreased Hgb level may indicate bone marrow suppression
- **Bone marrow suppression:** severe leukopenia, pancytopenia, thrombocytopenia
- **Monitor liver function studies:** alkaline phosphatase, AST, ALT, amylase, bilirubin; and for hepatotoxicity: dark urine, jaundice, itching, light-colored stools; product should be discontinued
- Monitor I&O, weight daily, report decreasing urine output, toxicity may occur
- Assess for **infection:** increased temp, WBC; sputum, urine

### Patient/family education

- Teach patient to take as prescribed, do not miss doses; if dose is missed on daily regimen, skip dose; if on multiple dosing/day, take as soon as remembered
- Teach patient that therapeutic response may take 3-4 mo in rheumatoid arthritis, to continue with prescribed exercise, rest, other medications; that product is needed for life in renal transplant
- Instruct patient to report fever, rash, severe diarrhea, chills, sore throat, fatigue, since serious infections may occur; or clay-colored stools and cramping (hepatotoxicity)
- Advise patient to use contraceptive measures during treatment for 16 wk after ending therapy; product is teratogenic
- Advise patient to avoid vaccinations
- Tell patient to avoid crowds and persons with known infections to reduce risk of infection
- Teach patient to take with food to decrease GI intolerance
- Teach patient regarding multiple significant drug/drug interactions
- Instruct patient not to use OTC medications without approval of prescriber
- Advise patient to use soft-bristled toothbrush to prevent bleeding

### Evaluation

**Positive therapeutic outcome**

- Absence of graft rejection
- Immunosuppression in autoimmune disorders
- Increased joint mobility without pain in rheumatoid arthritis

## azelaic acid topical

*See Appendix B*

## azelastine (Rx)

(ay′ze-lass-teen)

**Optivar**

*Func. class.:* Leukotriene synthesis inhibitor

*Chem. class.:* Phthalazinone derivative

**ACTION:** Inhibits the synthesis and release of leukotrienes; antagonizes action of acetylcholine, histamine, serotonin

**Therapeutic outcome:** Decreased nasal stuffiness, itching, swollen eyes

**USES:** Seasonal allergic rhinitis

### CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy

### DOSAGE AND ROUTES

**Adult and child ≥12 yr:** NASAL 2 sprays/nostril bid

**Available forms:** Spray 137 mcg/actuation

#### Implementation

- Remove cap/safety clip from spray pump
- Prime pump if using for first time, push 4 times quickly, away from face, blow your nose, then place tip of pump into one nostril, while holding other nostril closed, tilt head forward, and spray into nostril
- Put cover/safety clip back on

### ADVERSE EFFECTS

**CNS:** Sedation (more common with increased dosages), drowsiness

**MISC:** Weight increase, myalgia

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver, extensively |
| **Excretion** | Feces |
| **Half-life** | 25-42 hr |

#### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 4-5 hr |
| **Duration** | Unknown |

### INTERACTIONS

#### Individual drugs

Alcohol: increased CNS depression

#### Drug classifications

CNS depressants, opioids, sedative/hypnotics: increased CNS depression

### NURSING CONSIDERATIONS

#### Assessment

- Assess respiratory status: rate, rhythm, increase in bronchial secretions, wheezing, chest tightness; provide fluids to 2 L/day to decrease secretion thickness

#### Patient/family education

- Teach patient all aspects of product uses; to notify prescriber if confusion, sedation occur; to avoid driving and other hazardous activity if drowsiness occurs; to avoid alcohol and other CNS depressants that may potentiate effect
- Caution patient not to exceed recommended dosage; dysrhythmias may occur

#### Evaluation

**Positive therapeutic outcome**

- Absence of runny or congested nose

## azelastine nasal agent

*See Appendix B*

## azelastine ophthalmic

*See Appendix B*

## azilsartan

(ay-zil-sar′tan)

**Edarbi**

(Pronunciation)

*Func. class.:* Antihypertensive

*Chem class.:* Angiotensin II receptor antagonist

**ACTION:** Antagonizes angiotensin II at the $AT_1$ receptor in tissues like vascular smooth muscle and the adrenal gland. Two angiotensin II receptors, $AT_1$ and $AT_2$, have been identified; azilsartan exhibits more than a 10,000-fold greater affinity for the $AT_1$ receptor than the $AT_2$ receptor.

**Therapeutic outcome:** Decreased B/P

**USES:** Hypertension, alone or in combination with other antihypertensives

### CONTRAINDICATIONS

**BLACK BOX WARNING:** Pregnancy (2nd/3rd trimesters)

**Precautions:** Angioedema, African descent, renal disease, renal artery stenosis, children, geriatrics, heart failure, hypovolemia, breastfeeding, pregnancy 1st trimester

## DOSAGE AND ROUTES

**Adult:** PO 80 mg/day, may give an initial dose of 40 mg/day in patients receiving high-dose diuretic therapy

**Available forms:** Tabs 40, 80 mg

### Implementation

- May administer without regard to food
- Use original package to protect from light, moisture, and heat

## ADVERSE EFFECTS

**CNS:** Dizziness, fatigue, asthenia, syncope
**CV:** Hypotension, orthostatic hypotension
**GI:** Nausea, diarrhea
**HEMA:** Anemia
**INTEG:** Angioedema, rash, pruritus
**MS:** Muscle cramps
**RESP:** Cough

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Absolute bioavailability (60%) not affected by food; steady state within 5 days and no accumulation in plasma occurs with once-daily dosing; hydrolyzed to the active metabolite, azilsartan, in GI tract during absorption, rapidly absorbed |
| **Distribution** | Protein binding, >99%, to serum albumin |
| **Metabolism** | Metabolized by CYP2C9 |
| **Excretion** | 55% eliminated (feces), 42% (urine) |
| **Half-life** | Elimination half-life 11 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1.5-3 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

CycloSPORINE: in those with poor renal function, increased renal failure risk: monitor closely
Lithium: increased lithium toxicity
Sodium phosphate monobasic monohydrate, sodium phosphate dibasic anhydrous: increased phosphate nephropathy

### Drug classifications

Antidiabetics: increased hypoglycemia
NSAIDs in those with poor renal function: monitor closely: Increased renal failure risk
Other antihypertensives, other angiotensin receptor antagonists, MAOIs: increased hypotensive effect

### Drug/herb

Ephedra: decreased antihypertensive effect
Hawthorn: increased antihypertensive effect

## NURSING CONSIDERATIONS

### Assessment

- **Angioedema:** Assess for facial swelling, difficulty breathing

**BLACK BOX WARNING:** Pregnancy (2nd/3rd trimester), can cause fetal death, avoid breastfeeding

- Response and adverse reactions especially in renal disease
- B/P, pulse during beginning therapy and periodically thereafter; note rhythm, rate, quality; obtain electrolytes before beginning therapy

### Patient/family education

- Instruct patient to comply with dosage schedule even if feeling better

**BLACK BOX WARNING:** Instruct patient to notify prescriber of facial swelling; if pregnancy is planned or suspected (2nd/3rd trimester, do not use)

- Advise patient that diarrhea, dehydration, excessive perspiration, vomiting, may lead to fall in B/P, to consult prescriber if these occur
- Instruct patient to rise slowly from lying or sitting to minimize orthostatic hypotension; that product may cause dizziness
- Instruct patient to avoid OTC medications unless approved by prescriber; to inform all health care providers of product use
- Instruct patient to use proper technique for obtaining B/P

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P

## azithromycin (Rx)

(ay-zi-thro-my'sin)
**AzaSite, Zithromax, Zmax**
*Func. class.:* Antiinfective
*Chem. class.:* Macrolide (azalide)

**Do not confuse:** azithromycin/erythromycin, Zithromax/Zinacef

**ACTION:** Binds to 50S ribosomal subunits of susceptible bacteria and suppresses protein synthesis; much greater spectrum of activity than erythromycin; more effective against gram-negative organisms

**Therapeutic outcome:** Bacteriostatic against the following susceptible organisms:

PO, acute pharyngitis/tonsillitis (group A streptococcal); acute skin/soft tissue infections; community-acquired pneumonia

**USES:** Mild to moderate infections of the upper respiratory tract, in children: acute otitis media, lower respiratory tract; uncomplicated skin and skin structure infections, nongonococcal urethritis, or cervicitis; prophylaxis of disseminated *Mycobacterium avium* complex (MAC); *Bacillus anthracis, Bacteroides bivius, Bordetella pertussis, Borrelia burgdorferi, Campylobacter jejuni,* CDC coryneform group G, *Chlamydia trachomatis, Chlamydophila pneumoniae, Clostridium perfringens, Gardnerella vaginalis, Haemophilus ducreyi/influenzae* (beta-lactamase negative/positive), *Helicobacter pylori, Klebsiella granulomatis, Legionella pneumoniae/moraxella/catarrhalis, Mycobacterium avium/intracellulare, Mycoplasma genitalium/hominis/pneumoniae, Neisseria gonorrhoeae, Peptostreptococcus, Prevotella bivia, Rickettsia tsutsugamushi, Salmonella typhi, Staphylococcus aureus* (MSSA)*/epidermidis, Streptococcus, Toxoplasma gondii, Treponema pallidum, Ureaplasma urealyticum, Vibrio cholerae,* viridans streptococci; **opthalmic: bacterial conjunctivitis**

## CONTRAINDICATIONS

Hypersensitivity to azithromycin, erythromycin, or any macrolide, hepatitis, jaundice

**Precautions:** Pregnancy, breastfeeding, child <6 mo for otitis media, child <2 yr for pharyngitis, geriatric, renal/hepatic/cardiac disease, tonsillitis, QT prolongation, ulcerative colitis, torsades de pointes, sunlight exposure, sodium restriction, myasthenia gravis, pseudomembranous colitis, contact lenses, hypokalemia, hypomagnesemia

## DOSAGE AND ROUTES

### Most infections

**Adult:** PO 500 mg on day 1, then 250 mg daily on days 2-5 for a total dose of 1.5 g or 500 mg a day × 3 days
**Child 2-15 yr:** PO 10 mg/kg on day 1, then 5 mg/kg × 4 days

### Pelvic inflammatory disease

**Adult:** PO/**IV** 500 mg **IV** q24hr × 2 doses, then 250 mg PO q24hr × 7-10 days

### Cervicitis, chlamydia, chancroid, nongonococcal urethritis, syphilis

**Adult:** PO 1 g single dose

### Gonorrhea

**Adult:** PO 2 g single dose

### Endocarditis prophylaxis

**Adult:** PO 500 mg 1 hr prior to procedure
**Child:** PO 15 mg/kg 1 hr prior to procedure

### Community-acquired pneumonia

**Adult:** PO 500 mg on day 1, then 250 mg PO once daily on days 2-5
**Adolescent/child, infant ≥6 mo:** Susp PO 10 mg/kg on day 1, then 5 mg/kg/day on days 2-5
**Adult/adolescent, child ≥34 kg:** Ext Rel Susp PO 2 g as a single dose (≥1 hr before or 2 hr after a meal)
**Infant ≥6 mo and child weighing 5 to <34 kg and adolescent weighing <34 kg:** Ext Rel Susp PO 60 mg/kg as a single dose (≥1 hr before or 2 hr after a meal)
**Adult and adolescent ≥16 yr:** Initially, 500 mg **IV** infusion as a single daily dose × 2 days or more then 500 mg PO/day to complete a 7-10 day course
**Adolescent <16 yr, child, infant ≥3 mo: IV** 10 mg/kg, max 500 mg qd × 2 days, then conversion to oral therapy as soon as possible to complete a 5-day course. After **IV** loading doses have been given, oral dosage is 5 mg/kg/day, max 250 mg/dose

### Disseminated MAC infections

**Adult:** PO 600 mg/day in combination with ethambutol 15 mg/kg/day

### MAC in HIV

**Adult/adolescent:** PO 1.2 g qwk, alone or with rifabutin

### Lower respiratory tract infections

**Adult:** PO 500 mg day 1, then 250 mg × 4 days
**Child:** PO 5-12 mg/kg/day × 5 days

### Acute otitis media

**Child >6 mo:** PO 30 mg/kg as a single dose or 10 mg/kg daily × 3 days or 10 mg/kg as a single dose on day 1, max 500 mg/day, then 5 mg/kg on days 2-5, max 250 mg/day

### Prevention of acute otitis media

**Child:** PO 10 mg/kg qwk × 6 mo

### Bacterial conjunctivitis

**Adult/child ≥ 1 yr:** opthalmic instill 1 drop in affected eye bid × 2 days then 1 drop in eye q day × 5 days

**Available forms:** Tabs 250, 500, 600 mg; powder for inj 500 mg; powder for oral susp 1 g/packet; susp 100, 200 mg/5 ml; ophthalmic drops 1% sol

### Implementation

#### Opthalmic route

- Store in refrigerator
- Do not touch dropper to eye

**PO route**

- Provide adequate intake of fluids (2 L) during diarrhea episodes
- Give with a full glass of water; give susp 1 hr before or 2 hr after meals; tabs may be taken without regard to food; do not give with fruit juices
- Store at room temperature
- Reconstitute 1 g packet for susp with 60 ml water, mix, rinse glass with more water and have patient drink to consume all medication; packets not for pediatric use
- Do not take aluminum/magnesium-containing antacids or food simultaneously with this product

**Intermittent IV infusion route**

- **Reconstitute** 500 mg product/4.8 ml sterile water for inj (100 mg/ml), shake, **dilute** with ≥ 250 ml 0.9% NaCl, 0.45% NaCl, or LR to 1-2 mg/ml; diluted solution is stable for 24 hr or 7 days if refrigerated
- **Give** 1 mg/ml sol over 3 hr or 2 mg/ml sol over 1 hr, never give IM or as a bolus

**Y-site compatibilities:** Acyclovir, alatrofloxacin, alemtuzumab, alfentanil, aminocaproic acid, aminophylline, amphotericin B liposome/complex, ampicillin, ampicillin-sulbactam, anidulafungin, atenolol, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, carmustine, ceFAZolin, cefepime, cefoTEtan, cefOXitin, ceftaroline, cefTAZidime, ceftizoxime, cimetidine, cisatracurium, CISplatin, cyclophosphamide, cycloSPORINE, cytarabine, DAPTOmycin, DAUNOrubicin liposome, dexamethasone, dexmedetomidine, dexrazoxane, digoxin, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, doripenem, doxacurium, DOXOrubicin liposomal, doxycycline, droperidol, enalaprilat, EPINEPHrine, epiRUBicin, eptifibatide, ertapenem, esmolol, etoposide, etoposide phosphate, fenoldopam, fluconazole, fluorouracil, foscarnet, fosphenytoin, gallium, ganciclovir, gatifloxacin, gemcitabine, granisetron, haloperidol, heparin, hydrocortisone phosphate/succinate, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, inamrinone, irinotecan, isoproterenol, labetalol, lepirudin, magnesium sulfate, mannitol, meperidine, meropenem, mesna, mechlorethamine, methohexital, methotrexate, methylPREDNISolone, metoclopramide, metroNIDAZOLE, milrinone, minocycline, mivacurium, nalbuphine, naloxone, nesiritide, nitroglycerin, nitroprusside, octreotide, ofloxacin, ondansetron, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pantoprazole, PEMEtrexed, PENTobarbital, phenylephrine, piperacillin, potassium acetate/phosphates, procainamide, prochlorperazine, promethazine, propranolol, raNITIdine, remifentanil, rocuronium, sodium acetate, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, tacrolimus, telavancin, teniposide, thiotepa, ticarcillin, tigecycline, tirofiban, TPN, trimethobenzamide, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, voriconazole, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, vertigo, somnolence, fatigue

**CV:** Palpitations, chest pain, QT prolongation, torsades de pointes (rare)

**EENT:** Hearing loss, tinnitus, loss of smell (anosmia)

**GI:** *Nausea, diarrhea,* hepatotoxicity, abdominal pain, stomatitis, heartburn, dyspepsia, flatulence, melena, cholestatic jaundice, pseudomembranous colitis, tongue discoloration

**GU:** Vaginitis, moniliasis, nephritis

**HEMA:** Anemia

**INTEG:** Rash, urticaria, pruritus, photosensitivity, pain at injection site

**SYST:** Angioedema, Stevens-Johnson syndrome, toxic epidermal necrolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid (PO) up to 50% |
| **Distribution** | Widely distributed |
| **Metabolism** | Unknown, minimal metabolism |
| **Excretion** | Unchanged (bile); kidneys, minimal |
| **Half-life** | 11-70 hr |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | Unknown | Unknown |
| **Peak** | 2-4 hr | End of infusion |
| **Duration** | 24 hr | 24 hr |

## INTERACTIONS

### Individual drugs

Bromocriptine, carBAMazepine, cycloSPORINE, digoxin, disopyramide, methylPREDNISolone, nelfinavir, phenytoin, tacrolimus, theophylline, triazolam: increased effects of specific products

Ergotamine: ergot toxicity

Amiodarone, droperidol, methadone, nilotinib, propafenone, quiNIDine: increased QT prolongation

Pimozide: increased dysrhythmias; fatal reaction; do not use concurrently

Triazolam: decreased clearance of triazolam

### Drug classifications

Aluminum, magnesium antacids: decreased levels of azithromycin, separate by ≥2 hr

Anticoagulants (orals): increased effect of oral anticoagulants

### Drug/food

Decreased: absorption—food (suspension)

### Drug/lab test

Increased: bilirubin, alkaline phosphatase, CPK, BUN, creatinine, AST, ALT, potassium, blood glucose

Decreased: blood glucose, potassium, sodium

## NURSING CONSIDERATIONS

### Assessment

- **QT prolongation, torsades de pointes:** assess for patients with serious bradycardia, ongoing pro-arrhythmic conditions, or elderly; more common in these patients
- Assess for signs and symptoms of **infection:** drainage, fever, increased WBC >10,000/mm$^3$, urine culture positive, sore throat, sputum culture positive
- Monitor respiratory status: rate, character, wheezing, tightness in chest; discontinue product if these occur
- Monitor allergies before treatment, reaction of each medication; place allergies on chart, notify all people giving products; skin eruptions, itching
- Monitor I&O ratio, renal studies; report hematuria, oliguria in renal disease; check urinalysis, protein, blood
- Monitor liver studies: AST, ALT, bilirubin, LDH, alkaline phosphatase; CBC with diff
- Monitor C&S before product therapy; product may be taken as soon as culture is taken; C&S may be repeated after treatment
- **Assess for serious skin reactions:** Stevens-Johnson syndrome, toxic epidermal necrolysis, angioedema, discontinue if rash occurs
- **Assess for pseudomembranous colitis:** blood or pus in diarrhea stool, abdominal pain, fever, fatigue, anorexia; obtain CBC, serum albumin
- Assess for **superinfection:** sore throat, mouth, tongue; fever, fatigue, diarrhea, anogenital pruritus
- Pregnancy/breastfeeding: Use only if clearly needed, cautious use in breastfeeding, excreted in breast milk

### Patient/family education

- Instruct patient to report sore throat, black furry tongue, fever, loose foul-smelling stool, vaginal itching, discharge, fatigue; may indicate **superinfection**
- Caution patient not to take aluminum/magnesium-containing antacids or food simultaneously with this product; blood levels of azithromycin will be decreased
- Instruct patient to notify prescriber of diarrhea stools, dark urine, pale stools, yellow discoloration of eyes or skin, severe abdominal pain; cholestatic jaundice is a severe adverse reaction
- Teach patient to take Zmax 1 hr prior to or 2 hr after a meal; shake well before use
- Teach patient to complete dosage regimen; to notify prescriber if symptoms continue
- Teach patient to use protective clothing or stay out of the sun: photosensitivity may occur
- Teach patient to notify prescriber if pregnancy is suspected
- Cardiovascular death has occurred in those with serious bradycardia or ongoing hypokalemia, hypomagnesemia; avoid use

### Evaluation

**Positive therapeutic outcome**

- C&S negative for infection
- WBC within 5000-10,000/mm$^3$

**azithromycin ophthalmic**
*See Appendix B*

abacavir (Rx)
acarbose (Rx)
acetylcholine ophthalmic
acyclovir topical
adenosine (Rx)
albiglutide
albuterol (Rx)
alfuzosin (Rx)
allopurinol (Rx)
alosetron
aluminum hydroxide (OTC)
ambrisentan (Rx)
amino acid (Rx)
amLODIPine (Rx)
amphotericin B lipid complex (ABLC)
ampicillin/sulbactam (Rx)
anidulafungin (Rx)
apremilast
arformoterol (Rx)
asenapine (Rx)
atazanavir (Rx)
atezolizumab
atovaquone (Rx)
axitinib
azelaic acid topical
azelastine ophthalmic
azithromycin ophthalmic
abatacept (Rx)
acetaminophen (OTC) (Paracetamol)
acetylcysteine (Rx)
adalimumab (Rx)
ado-trastuzumab
albumin, human 5% (Rx)
alemtuzumab
alirocumab (Rx)
almotriptan (Rx)
ALPRAZolam (Rx)
alvimopan (Rx)
amikacin (Rx)
amiodarone (Rx)
amoxicillin (Rx)
amphotericin B liposomal (LAmB)
anakinra (Rx)
antihemophilic factor recombinant, single chain
aprepitant (Rx)
argatroban (Rx)
aspirin (acetylsalicylic acid, ASA) (OTC)
atazanavir/cobicistat
atomoxetine (Rx)
atropine (Rx)
azaCITIDine (Rx)
azelastine (Rx)
azilsartan
abiraterone
acetaZOLAMIDE (Rx)
acyclovir (Rx)
adefovir (Rx)
afatinib
albumin, human 25% (Rx)
alendronate (Rx)
aliskiren (Rx)
alogliptin
alteplase (Rx)
amantadine (Rx)
aMILoride (Rx)
amitriptyline (Rx)
amoxicillin/clavulanate (Rx)
ampicillin (Rx)
anastrozole (Rx)
apraclonidine ophthalmic
fosaprepitant
ARIPiprazole (Rx)
aspirin/omeprazole
atenolol (Rx)
atorvastatin (Rx)
atropine ophthalmic
azaTHIOprine (Rx)
azelastine nasal agent
azithromycin (Rx)

## baclofen (Rx)

(bak′loe-fen)

**Gablofen, Lioresal Intrathecal**

*Func. class.:* Skeletal muscle relaxant, central acting

*Chem. class.:* GABA, chlorophenyl derivative

**Do not confuse:** Lioresal/Lotensin, baclofen/Bactroban/bacitracin

**ACTION:** Inhibits synaptic responses in CNS by stimulating $GABA_B$ receptor subtype, which decreases neurotransmitter function, decreasing frequency, severity of muscle spasms

**Therapeutic outcome:** Decreased spasticity of muscles

**USES:** Spasticity in spinal cord injury, multiple sclerosis

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, geriatric, peptic ulcer, renal/hepatic disease, stroke, seizure disorder, diabetes mellitus, psychosis. Abrupt discontinuation (Intrathecal)

## DOSAGE AND ROUTES

### Spasticity in multiple sclerosis/spinal cord injury

**Adult, child ≥12 yr:** PO 5 mg tid × 3 days, then 10 mg tid × 3 days, then 15 mg tid × 3 days, then 20 mg tid × 3 days, then titrated to response, max 80 mg/day (20 mg qid); IT use implantable IT inf pump; use screening trial of 3 separate bol doses if needed 24 hr apart (50 mcg/ml, 75 mcg/1.5 ml, 100 mcg/2 ml); patients who do not respond to 100 mcg should not be considered for chronic IT therapy; spinal origin spasticity 12-2003 mcg/day; cerebral origin spasticity 22-1400 mcg/day

**Child 2-7 yr:** PO 10-15 mg/day divided q8hr; titrate every 3 days by 5-15 mg/day to max 40 mg/day

**Child ≥8 yr:** As above, max 60 mg/day

**Child:** IT initial test dose same as adult; for small children, initial dose of 25 mcg/dose may be used; 25-1200 mcg/day inf, titrated to response in screening phase

**Available forms:** Tabs 10, 20 mg; IT inj 10,000 mcg/20 ml, 20,000 mcg/20 ml, 40,000 mcg/20 ml; 50 mcg/ml, 0.05 mcg/ml, 10 mg/20 ml, 10 mg/5 ml, 50 mg/20 ml; pharmacy can prepare extemporaneous liquid preparations

### Implementation

**PO route**

- Give with meals for GI symptoms; gum, frequent sips of water for dry mouth
- Store in airtight container at room temperature

**IT route**

- **For screening,** dilute to a concentration of 50 mcg/ml with NaCl for inj (preservative free); give test over 1 min; watch for decreasing muscle tone, frequency of spasm; if inadequate, use two more test doses q24hr; **maintenance inf** via implantable pump of 500-2000 mcg/ml dosage because individual titration is required
- Do not give IT dose by inj, **IV,** IM, SUBCUT, epidural

**BLACK BOX WARNING:** Don't discontinue abruptly, may be fatal

## ADVERSE EFFECTS

**CNS:** *Dizziness, weakness, fatigue, drowsiness,* headache, disorientation, insomnia, paresthesias, tremors, seizures, coma; life-threatening CNS depression, impaired cognition, memory loss, insomnia, somnolence, CNS infection (IT)

**CV:** Hypotension, bradycardia, flushing, orthostatic hypotension, chest pain, palpitations, edema; cardiovascular collapse (IT)

**EENT:** Nasal congestion, blurred vision, mydriasis, tinnitus

**GI:** *Nausea,* constipation, vomiting, abdominal pain, dry mouth, anorexia, weight gain

**GU:** Urinary frequency, hematuria

**INTEG:** Rash, pruritus

**RESP:** Dyspnea, respiratory failure (IT)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Good (PO) |
| **Distribution** | Widely, crosses placenta, protein binding 30% |
| **Metabolism** | Liver, partially |
| **Excretion** | Kidney, unchanged 70%-80% |
| **Half-life** | 2½-4 hr |

### Pharmacodynamics

| | PO/IT |
|---|---|
| **Onset** | 0.5-1 hr |
| **Peak** | 2-3 hr |
| **Duration** | >8 hr |

## INTERACTIONS

### Individual drugs

Alcohol: CNS depression

### Drug classifications
Antidepressants (tricyclics), antihistamines, barbiturates, MAOIs, opioids, sedative/hypnotics: increased CNS depression, avoid concurrent use
Antihypertensives: increased hypotension

### Drug/herb
Kava, valerian, chamomile: increased CNS depression

### Drug/lab test
Increased: AST, ALT, alkaline phosphatase, blood glucose, CK

## NURSING CONSIDERATIONS
### Assessment
- Abrupt discontinuation Serious adverse reactions may occur with intrathecal route
- **Multiple sclerosis:** spasms, spasticity, ataxia, mobility, improvement should occur
- Monitor B/P, weight, blood glucose, and hepatic function periodically
- **Withdrawal symptoms:** Agitation, tachycardia, insomnia, hyperpyrexia
- Check for increased seizure activity in patients with epilepsy; this product decreases seizure threshold, monitor ECG
- Check I&O ratio; check for urinary retention, frequency, hesitancy
- Allergic reactions: rash, fever, respiratory distress; severe weakness, numbness in extremities
- Assess CNS depression: dizziness, drowsiness, psychiatric symptoms
- Check dosage, as individual titration is required
- Assess for CNS depression, dizziness, drowsiness, psychiatric symptoms
- **Intrathecal:** Have emergency equipment nearby; assess test dose and titration, if there is no response, check pump and catheter for proper functioning
- **Pregnancy/breastfeeding:** Use in pregnancy only if benefits outweigh fetal risk, avoid breastfeeding, excretion unknown

### Patient/family education
- Advise patient not to discontinue medication quickly; hallucinations, spasticity, tachycardia will occur; product should be tapered off over 1-2 wk, especially intrathecal form
- Advise patient not to take with alcohol, other CNS depressants
- Teach patient to avoid hazardous activities if drowsiness, dizziness occurs; to rise slowly to prevent orthostatic hypotension
- Teach patient to avoid using OTC medications: cough preparations, antihistamines, unless directed by prescriber; to take with food or milk
- Teach patient to notify prescriber if nausea, headache, tinnitus, insomnia, confusion, constipation, or inadequate, painful urination continues

**Pregnancy/breastfeeding:** To notify if pregnancy is planned or suspected, avoid breastfeeding
- May require 1-2 mo for full response

### Evaluation
**Positive therapeutic outcome**
- Decreased pain, spasticity, ability to perform ADLs

## TREATMENT OF OVERDOSE:
Induce emesis of conscious patient, dialysis, physostigmine to reduce life-threatening CNS side effects

**⚠ HIGH ALERT**

## basiliximab (Rx)
(bas-ih-liks'ih-mab)
**Simulect**
*Func. class.:* Immunosuppressant
*Chem. class.:* Murine/human monoclonal antibody (interleukin-2) receptor antagonist

**ACTION:** Binds to and blocks the IL-2 receptor, which is selectively expressed on the surface of activated T lymphocytes; impairs the immune system to antigenic challenges

**Therapeutic outcome:** Prevention of graft rejection

**USES:** Acute allograft rejection in renal transplant patients when used with cycloSPORINE and corticosteroids

## CONTRAINDICATIONS
Mannitol, murine protein hypersensitivity

**Precautions:** Pregnancy, children, geriatric, infections, breastfeeding, neoplastic disease, vaccination

**BLACK BOX WARNING:** Requires a specialized care setting and experienced clinician

## DOSAGE AND ROUTES
**Adult/child ≥35 kg: IV** 20 mg × 2 doses; first dose within 2 hr before transplant surgery; second dose given 4 days after transplantation
**Child <35 kg: IV** 10 mg × 2 doses; first dose within 2 hr before transplant surgery; second dose given 4 days after transplantation

**Available forms:** Powder for inj 10, 20 mg

### Implementation

**Intermittent IV INF route**
- **Reconstitute** 10 mg vial/2.5 ml or 20 mg vial in 5 ml sterile water for inj; shake gently to dissolve, **dilute** reconstituted sol in 25 ml (10 mg vial) or 50 ml (20 mg vial) with 0.9% NaCl or $D_5W$, gently invert bag, do not shake, **give** over ½ hr, do not admix
- Storage of reconstituted sol refrigerated for up to 24 hr or at room temp for 4 hr

## ADVERSE EFFECTS

**CNS:** *Pyrexia, chills, tremors, headache, insomnia, weakness,* dizziness; psychiatric/behavioral changes (child)
**CV:** *Chest pain,* angina, cardiac failure, hypo/hypertension, edema
**GI:** *Vomiting, nausea, diarrhea,* constipation, abdominal pain, GI bleeding, gingival hyperplasia, stomatitis
**GU:** Urinary retention/ frequency
**INTEG:** *Acne,* pruritus, impaired wound healing
**META:** Acidosis, hypercholesterolemia, hyperuricemia, hypo/hyperkalemia, hypocalcemia, hypophosphatemia
**MISC:** Infection, moniliasis, anaphylaxis, anemia, allergic reaction, dysuria, CMV infection, candidiasis, abnormal vision
**MS:** Arthralgia, myalgia
**RESP:** *Dyspnea, wheezing, cough,* pulmonary edema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 7 days (adult)<br>9½ days (child) |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | ½ hr (adult) |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Immunosuppressants: increased immunosuppression

### Drug/herb

Echinacea, melatonin: Decreased immunosuppression

### Drug/lab test

Increased: BUN, cholesterol, uric acid, creatinine, potassium, calcium, blood glucose, Hgb, Hct
Decreased: Hgb, Hct, platelets, magnesium, phosphate

## NURSING CONSIDERATIONS

### Assessment

- Assess for infection, increased temp, WBC, sputum, urine, may be fatal (bacterial, protozoal, fungal)
- Monitor blood studies: Hgb, WBC, platelets during treatment qmo; if leukocytes are $<3000/mm^3$, product should be discontinued
- Monitor liver function studies: alkaline phosphatase, AST, ALT, bilirubin
- **Assess hepatotoxicity:** dark urine, jaundice, itching, light-colored stools; product should be discontinued
- **Assess for anaphylaxis, hypersensitivity:** dyspnea, wheezing, rash, pruritus, hypotension, tachycardia; if severe hypersensitivity reactions occur, product should not be used again
- **Pregnancy/breastfeeding:** Use in pregnancy only if benefits outweigh fetal risk, caution use in breastfeeding, excretion unknown

### Patient/family education

- Instruct patient to report fever, chills, sore throat, fatigue, since serious infection may occur; avoid crowds, persons with known upper respiratory infections; use contraception during treatment

### Evaluation

**Positive therapeutic outcome**
- Absence of graft rejection

## beclomethasone (Rx, inhalation)

(be-kloe-meth'a-sone)
**QVAR**
*Func. class.:* antiasthmatic
*Chem. class.:* corticosteroid

**Do not confuse:** beclomethasone/ betamethasone

**ACTION:** Prevents inflammation by suppression of migration of polymorphonuclear leukocytes, fibroblasts, reversal of increased capillary permeability and lysosomal stabilization; does not suppress hypothalamus and pituitary function

**Therapeutic outcome:** Decreased inflammation and normal immunity

**USES:** Seasonal, perennial allergic/vasomotor rhinitis, nasal polyps, chronic steroid-dependent asthma

## CONTRAINDICATIONS

Hypersensitivity, status asthmaticus (primary treatment)

**Precautions:** Pregnancy, breastfeeding, child <12, nasal disease/surgery, nonasthmatic bronchial disease, bacterial, fungal, viral infections of mouth, throat, lungs, HPA suppression, osteoporosis, Cushing's syndrome, diabetes mellitus, measles, cataracts, corticosteroid hypersensitivity, glaucoma, herpes infection

## DOSAGE AND ROUTES

**Adult and child >12 yr:** inh 48-80 mcg bid (alone) or 40-160 mcg bid (with inhaled corticosteroids), max 320 bid

**Child 5-12 yr:** inh 40 mcg bid, max 80 mcg bid

**Available forms:** Oral inh 40, 80, 250 mcg /metered spray

### Implementation

**Oral route**

- Give PO, using a spacer device for proper dose
- Shake oral inhaler well, use spacer
- Use after cleaning aerosol top daily with warm water; dry thoroughly
- Store in cool environment; do not puncture or incinerate container

**Nasal route**

- Shake inhaler, invert, tilt head backward, insert nozzle into nostril, away from septum; hold other nostril closed and depress activator, inhale through nose, exhale through mouth

## ADVERSE EFFECTS

**CNS:** *Headache;* psychiatric/behavioral changes (child)

**EENT:** *Candidal infection of oral cavity, hoarseness,* sore throat, dysgeusia, loss of taste/smell, pharyngitis, rhinitis, sinusitis, cataracts, fungal infections, epistaxis

**ENDO:** Hypothalamic-pituitary (HPA) suppression

**GI:** Dry mouth, dyspepsia

**MISC:** Angioedema, adrenal insufficiency, facial edema, Churg-Strauss syndrome (rare)

**RESP:** Bronchospasm, wheezing, cough

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Locally only |
| **Distribution** | Not distributed |
| **Metabolism** | Lungs, liver (by CYP3A) |
| **Excretion** | Feces, urine |
| **Half-life** | 2.8 hr |

### Pharmacodynamics

| | Inh | Nasal |
|---|---|---|
| **Onset** | 1-4 wk | 10 min |
| **Peak** | Unknown | Unknown |
| **Duration** | Unknown | Unknown |

## NURSING CONSIDERATIONS

### Assessment

- Assess adrenal suppression: 17-KS, plasma cortisol for decreased levels, adrenal function periodically for HPA axis suppression during prolonged therapy; monitor growth and development
- Assess blood studies, neutrophils, decreased platelets; WBC with diff at baseline and q3mo; if neutrophils are <1000/mm$^3$, discontinue treatment
- Check nasal passages during long-term treatment for changes in mucus; check for burning, stinging; assess for glucocorticoid withdrawal: dizziness, hypotension, fatigue, muscle/joint pain; notify prescriber immediately
- Assess respiratory status: rest, rhythm, characteristics; auscultate lung bilaterally before and throughout treatment
- Assess for fungal infections in mucous membranes
- **Pregnancy/breastfeeding:** Inhaled product: fetal harm appears remote, acceptable to use in breastfeeding
- **Bronchospasm:** Use short-acting bronchodilator
- **Upper respiratory infection, especially fungal**
- **Beers:** Avoid use in older adults, high risk of delirium

### Patient/family education

- Teach patient to gargle/rinse mouth after each use to prevent oral fungal infections
- Teach patient that in times of stress, systemic corticosteroids may be needed to prevent adrenal insufficiency; do not discontinue oral product abruptly, taper slowly
- Teach patient to continue using product even if mild nasal bleeding occurs; is usually transient
- Teach patient method of administration after providing written instructions from manufacturer

### Pregnancy/breastfeeding:

- Teach patient to notify prescriber if pregnancy is planned or suspected, do not breastfeed
- Teach patient to check growth in child on long-term therapy
- Teach patient to taper PO products before starting inhalation products
- Teach patient to carry medical alert ID with corticosteroid user listed
- Clean inhaler by wiping with dry cloth, need for spacer or face mask

• Teach patient the symptoms of **adrenal insufficiency:** nausea, anorexia, fatigue, dizziness, dyspnea, weakness, joint pain, depression

### Evaluate

**Positive therapeutic outcome**

• Decrease in runny nose, improved symptoms of bronchial asthma

## beclomethasone nasal (Rx) agent

*See Appendix B*

## belatacept (Rx) REMS

(bel-a-ta′sept)

**Nulojix**

*Func. class.:* Biologic response modifier

*Chem. class.:* Fusion protein (Immunosuppressant

**Do not confuse:** belatacept/ Betasept Surgical Scrub

**ACTION:** Activated T lymphocytes are the mediators of immunologic rejection, and this product is a selective T-cell costimulation blocker; blocks the CD28 mediated co-stimulation of T lymphocytes by binding to CD80 and CD86 on antigen-presenting cells; inhibits T-lymphocyte proliferation and the production of the cytokines interleukin-2, interferon-gamma, interleukin-4, and TNF-alpha.

**Therapeutic outcome:** Absence of kidney transplant rejection

**USES:** Kidney transplant rejection prophylaxis given with basiliximab induction, mycophenolate mofetil, corticosteroids

### CONTRAINDICATIONS

Hypersensitivity, EBV seronegative, and specialized setting, EBV status unknown

**BLACK BOX WARNING:** Infection, organ transplant, requires an experienced clinician, secondary malignancy, posttransplant lymphoproliferation disorder (PTLD)

**Precautions:** Breastfeeding, immunosuppression, child/infant/neonate, pregnancy, diabetes mellitus, progressive multifocal leukoencephalopathy, immunosuppression, sunlight exposure, TB

### DOSAGE AND ROUTES

**Adult: IV** 10 mg/kg rounded to nearest 12.5 mg increment give over 30 min the day of transplantation (day 1) but before transplantation, on day 5 approximately 96 hours after the day 1 dose 1, at the end of wk 2, at the end of wk 4, at the end of wk 8, and at the end of wk 12; maintenance dosage is 5 mg/kg rounded to nearest 12.5 mg increment given over 30 min at the end of wk 16 and q4wk ± 3 days thereafter; doses should be calculated on actual body weight on the transplantation day unless the patient's weight varies by >10%

### Available forms:

Powder for inj 250 mg

### Implementation

**BLACK BOX WARNING:** Only providers skilled in the use of immunosuppressant and management of transplant should use these products

• Increased risk for serious infection, malignancy, ENLIST Registry for drug safety monitoring 1-800-321-1335

• **Restricted access:** New prescriptions not available as of March 2017; current patients must be enrolled in the Nulojix distribution program 1-877-625-2566

**IV route**

• Visually inspect for particulate matter, discoloration, discard if present

• Calculate the number of vials required

• Reconstitute each vial/10.5 ml of sterile water for injection, 0.9% sodium chloride, $D_5W$ using the silicone-free disposable syringe provided with each vial and an 18G to 21G needle. If silicone-free disposable syringe, use a new silicone-free disposable syringe. If you need additional silicone-free disposable syringes, call 888-685-6549. If the powder is accidentally reconstituted using a different syringe than the one provided, the solution may develop a few translucent particles. Discard any solutions prepared using siliconized syringes.

• Using aseptic technique, inject the diluent into the vial and direct the stream of diluent to the glass wall of the vial. To minimize foaming, rotate and invert with gentle swirling until the contents are dissolved. Do not shake when reconstituted (25 mg/ml), should be clear to slightly opalescent and colorless to pale yellow. Do not use if opaque particles, discoloration, or other foreign particles are present.

• Calculate the total volume of the reconstituted 25 mg/ml sol required to provide the prescribed dose. Further dilute this volume with a volume of inf fluid equal to the volume of the reconstituted drug sol required. Use either NS or $D_5W$ if drug was reconstituted with SWFI; use NS if drug was reconstituted with NS; use $D_5W$ if drug was reconstituted with $D_5W$. With the same silicone-free disposable syringe used for reconstitution, withdraw the required amount, inject it into the inf container, gently rotate; final concentration in inf container should range (2-10 mg/ml). Volume of 100 ml will be appropriate for

most doses, but total inf volumes ranging from 50-250 ml may be used. Discard any unused drug solution; after reconstitution, immediately transfer the reconstituted sol from the vial to the inf bag or bottle; complete within 24 hr.

**IV INF route**

- Give over 30 min, use an infusion set and a sterile, nonpyrogenic low-protein-binding filter (0.2-1.2 mm), use a separate line
- Storage: refrigerate, protect from light ≤24 hr; max 4 hr of the total 24 hr can be at room temp and room light

## ADVERSE EFFECTS

**CV:** Hypo/hypertension
**CNS:** progressive multifocal leukoencephalopathy (PMI), anxiety, dizziness, fever, insomnia, tremor
**EENT:** Pharyngitis, stomatitis
**GI:** Abdominal pain, constipation, diarrhea, nausea, vomiting
**GU:** Renal tubular necrosis, renal failure, proteinuria, urinary incontinence, dysuria, UTI
**HEMA:** Anemia, neutropenia, leukopenia, leukoencephalopathy
**INTEG:** Acne, alopecia, infusion reaction
**META:** Hypercholesterolemia, hyperglycemia, hyper/hypokalemia, hypocalcemia, hypophosphatemia, hypomagnesemia
**MS:** Arthralgia
**SYST:** Secondary malignancy, posttransplant lymphoproliferation disorder (PTLD), wound dehiscence, BK-virus associated neuropathy

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Steady state by week 8 after transplantation and by month 6 during the maintenance phase |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Half-life range 6.1-15.1 days during receipt of 10 mg/kg IV doses; 3.1-11.9 days during receipt of 5 mg/kg IV doses |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

- Increased effect, toxicity: mycophenolic acid
- Do not use 30 days before or with this product: Live virus vaccines

### Drug classifications

Corticosteroids: increased belatacept effect
Vaccines: avoid concurrent use
Immunosuppressives: avoid increased dose

## NURSING CONSIDERATIONS

### Assessment

- Progressive multifocal leukoencephalopathy (PMI): apathy, confusion, ataxia may occur during treatment

**BLACK BOX WARNING: Transplant rejection:** flulike symptoms, decreasing urinary output, malaise; some may experience pain in area (rare; monitor BUN/Creatinine)

**BLACK BOX WARNING: Infection:** Monitor for fever, immunosuppression occurs, chills, increased WBC, wound dehiscences

**BLACK BOX WARNING: Posttransplant lymphoproliferation disorder (PTLD):** May lead to secondary malignancy (lymphoma) or infectious mononucleosislike lesions (mood change, confusion, memory loss, change in gait, talking); may be treated with antivirals or immunosuppressant may need to be discontinued

- Hyperlipidemia: Monitor cholesterol, triglycerides; an antilipidemic may be needed
- Store refrigerated, protected from light ≤24 hr; max 4 hr of the total 24 hr can be at room temperature and room light
- **Pregnancy/breastfeeding:** Use in pregnancy if benefits outweigh fetal risk, pregnant patients should enroll in the pregnancy registry 1-877-681-6296, use adequate contraception during and for 4 months after last dose, discontinue breastfeeding or product, excretion in breast milk unknown

### Evaluation

**Positive therapeutic outcome**

- Absence of renal transplant rejection

### Patient/family education

- Teach reason for product and expected result, use REMS guidelines
- Teach to avoid exposure to sunlight, tanning beds, risk of secondary malignancy
- Teach to avoid crowds, persons with known infections
- Advise that repeated lab test will be needed, to inform providers of all OTC, Rx medications, herbs, supplements
- Advise to avoid with vaccines
- Advise that immunosuppressants will be needed for life to prevent rejection/infection;

teach symptoms of rejection and to call provider immediately

## belimumab (Rx)

(be-lim′ue-mab)

**Benlysta**

*Func. class.:* Immunosuppressant, Monoclonal antibody

*Chem. class.:* Disease-modifying antirheumatic drugs (DMARDs)

**ACTION:** Inhibits B-lymphocyte stimulator (BLyS), which is needed for B-cell survival; normally, soluble BLyS binds to its receptors on B cells and allows B-cell survival; binds BLyS and prevents binding to its receptors on B cells

**Therapeutic outcome:** Decreasing symptoms of SLE: decreased fever, malaise, joint pains, myalgias, fatigue

**USES:** Active, autoantibody-positive, systemic lupus erythematosus (SLE) in combination with standard therapy

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** African descent patients, depression, children/infants, Box immunosuppression, infection, pregnancy, breastfeeding, suicidal ideation, vaccination, geriatrics, secondary malignancy, cardiac disease, requires experienced clinician

## DOSAGE AND ROUTES

**Adult:** 10 mg/kg IV over 1 hr q2wk for the first 3 doses, then q4wk

**Available forms:** Powder for injection 120, 400 mg

### Implementation

- Only health care providers prepared to manage anaphylaxis should administer this product, may give premedication for prophylaxis against infusion and hypersensitivity reactions (antihistamine/antipyretic)

**Intermittent IV infusion route**

- Visually inspect particulate matter and discoloration whenever solution and container permit
- **Give** as IV infusion only, do not give IV bolus or push, give over 1 hr and slow or stop if infusion reactions occur
- Do not give with any other agents in the same IV line
- Allow to stand at room temperature for 10-15 min before using
- **Reconstitute** with the appropriate amount of sterile water for injection (80 mg/ml); add 1.5 ml of sterile water (120 mg/vial) or 4.8 ml of sterile water (400 mg/vial)
- Direct the stream of sterile water toward the side of the vial to minimize foaming; gently swirl for 60 sec and allow to sit during reconstitution, gently swirling for 60 secs q5min until the powder is dissolved; do not shake; reconstitution is complete in 10 to 30 min
- If a mechanical reconstitution device (swirler) is used, max 500 rpm swirled for ≤30 min
- The solution should be opalescent, and colorless to pale yellow, and without particles; small air bubbles are expected; protect from sunlight
- **Dilution:** Only dilute in NS for injection; dilute reconstituted solution with enough normal saline to 250 ml. From a 250-ml infusion bag or bottle of normal saline, withdraw and discard a volume equal to the volume of the reconstituted solution required for dose; add the required volume of the reconstituted solution the infusion bag/bottle; gently invert to mix
- Discard any unused solution
- Storage in refrigerator or at room temp; total time from reconstitution to completion of inf max 8 hr

## ADVERSE EFFECTS

**CNS:** Anxiety, *depression,* dizziness, fever, headache, *insomnia, migraine*, suicidal ideation, progressive multifocal leukoencephalopathy
**CV:** Bradycardia, hypotension
**GU:** UTI
**GI:** Diarrhea, nausea
**MISC:** Bronchitis, cystitis, dyspnea, **leukopenia,** myalgia, nasopharyngitis, pharyngitis, rash
**SYST:** Anaphylaxis, angioedema, antibody formation, infection, influenza, infusion reactions, secondary malignancy

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Terminal half-life 19.4 days; distribution half-life 1.75 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Drug/Herb

Echinacea: Decreases product effect, avoid using together

### Individual drugs
IV cyclophosphamide, biologic therapies (riTUXimab, ofatumumab): avoid concurrent use

### Drug classifications
Vaccines: within 30 days of belimumab, response to vaccine will be decreased

### Drug/lab test
Decrease: leukocytes

## NURSING CONSIDERATIONS

### Assessment
- **SLE:** Monitor for decreasing fever, malaise, fatigue, joint pain, myalgias
- **Progressive multifocal leukoencephalopathy:** Apathy, confusion, ataxia, cognitive problems
- **Suicidal ideation:** More common in those with preexisting depression
- **Infection:** Determine if a chronic or acute infection is present, may be fatal when used with this product; do not begin therapy if any products are being used for a chronic infection; leukopenia may occur with this product and susceptibility to infections increased
- **Anaphylaxis, infusion site reactions:** If these occur, stop infusion (angioedema, rash, pruritus, wheezing)
- **African descent patients:** Use cautiously in these patients, may not respond to this product
- Cardiac disease: Monitor closely for cardiovascular side effects, bradycardia, hypotension
- **Pregnancy/breastfeeding:** Determine if pregnant or if pregnancy is planned or suspected, if pregnant call 877-681-6269 to enroll in registry, do not breastfeed; contraception is required during and for 4 mo after conclusion of therapy

### Patient/family education
- Teach patient to notify prescriber if pregnancy is planned or suspected, use reliable contraception during and for 4 mo after final treatment, to avoid breastfeeding
- Advise patient to seek treatment immediately for serious hypersensitive reactions
- Advise patient not to receive live vaccinations during treatment
- Teach patient that compliance is required
- Teach patient to avoid others with known infections, to report fever, cough, sore throat immediately
- Teach patient to report history of cancer in patient or family

### Evaluation
- Decreasing symptoms of SLE: decreasing fatigue, fever, malaise

**⚠ HIGH ALERT**

# belinostat (Rx)

(beh-lih'noh-stat')

**Beleodaq**

*Func. class.:* Antineoplastic-biologic response modifier

*Chem. class.:* Histone deacetylase inhibitors

**Do not confuse:** belinostat/beractant

**ACTION:** A class I and II inhibitor of the histone deacetylase (HDAC) enzymes. Overexpression of HDACs is present in some cancer cells. HDAC inhibitors have been shown to activate differentiation, inhibit the cell cycle, and induce apoptosis

**Therapeutic outcome:** Prevention of spread of disease

**USES:** For the treatment of relapsed or refractory peripheral T-cell lymphoma (PTCL)

## CONTRAINDICATIONS
Hypersensitivity, pregnancy

**Precautions:** Hematologic toxicity (thrombocytopenia, leukopenia, neutropenia, lymphopenia, anemia), serious infections (pneumonia, sepsis), fatal hepatic toxicity, tumor lysis syndrome (TLS), breastfeeding

## DOSAGE AND ROUTES

**Adult: IV** 1000 mg/m$^2$ over 30 min on days 1-5 q21d. Reduce the dose to 750 mg/m$^2$ in those who are homozygous for the UGT1A1*28 allele. Cycles should be repeated until disease progression or unacceptable toxicity.

**Available forms:** Powder for injection 500 mg (single-use vial)

### Implementation

**Intermittent IV route**
- Reconstitution: Add 9 ml of sterile water for injection/500 mg, swirl until there are no visible particles in the solution (50 mg/ml); stable at room temperature for up to 12 hr
- Withdraw the appropriate amount from the reconstituted vial and further dilute in 250 ml 0.9% sodium chloride for injection; the final solution is stable at room temperature for up to 36 hr, including infusion time; use a 0.22-micron in-line filter; give over 30 min; if pain occurs at infusion site, run over 45 min

**Dose adjustments due to treatment-related toxicity**

**Hematologic toxicities:**
- Do not begin the next cycle of treatment until the absolute neutrophil count (ANC) is ≥1000/mm$^3$ and platelet count ≥50,000/mm$^3$

- ANC nadir ≥500/mm³ and platelet count nadir ≥25,000/mm³: no dose adjustment
- ANC nadir <500/mm³ (any platelet count): begin next cycle of treatment at a reduced dose of 750 mg/m². For the second occurrence of an ANC nadir <500/mm³, reduce the dose of the next cycle to 500 mg/m², if the ANC nadir is <500/mm³ after 2 dose reductions, discontinue therapy
- Platelet nadir <25,000/mm³ (any ANC): begin next cycle of treatment at a reduced dose of 750 mg/m². For the second occurrence of a platelet nadir <25,000/mm³, reduce the dose of the next cycle to 500 mg/m². If the platelet nadir is <25,000/mm³ after 2 dose reductions, discontinue therapy.

**Nonhematologic toxicities:**

- Grade 3 or 4 nausea, vomiting, or diarrhea for >7 days with supportive management, or other grade 3 or 4 toxicity of any duration: hold treatment. When toxicity resolves to grade ≤2, restart the next cycle at a reduced dose of 750 mg/m². For the second occurrence of grade 3 or 4 toxicity (for a duration >7 days with supportive management for GI toxicities), resume therapy at 500 mg/m² upon resolution to grade ≤2. If the grade 3 or 4 toxicity recurs after 2 dose reductions, discontinue therapy.

## ADVERSE EFFECTS

**CNS:** Fatigue headache dizziness, fever, chills
**CV:** Hypotension, QT prolongation
**GI:** *Constipation, anorexia, abdominal pain, nausea, vomiting, diarrhea,* hepatotoxicity
**HEMA:** Anemia, thrombocytopenia, neutropenia
**INTEG:** Injection-site reactions, rash, phlebitis
**MISC:** Hypokalemia
**RESP:** Dyspnea, cough
**SYST:** Multiorgan failure, TLS, serious infections, tumor lysis syndrome TLS

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 92.9%-95.8% protein bound |
| **Metabolism** | 80%-90% metabolized by hepatic UGT1A1; liver |
| **Excretion** | 40% excreted renally, primarily as metabolites |
| **Half-life** | 1.1 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Strong UGT1A1 inhibitors (atazanavir, indinavir); avoid concurrent use if possible: increased belinostat

### Drug/lab tests

Increase: Creatinine, LDH
Decrease: Platelets, neutrophils, RBC

## NURSING CONSIDERATIONS

### Assessment

- **Hematologic toxicity (thrombocytopenia, leukopenia, neutropenia, lymphopenia, anemia):** Monitor CBC before starting therapy and then every week. Dose modifications may be necessary in patients with bone marrow suppression and should be determined by the ANC and platelet count nadirs of the previous cycle of therapy. Platelet counts should be ≥50,000/mm³ and ANC >1000/mm³ before starting each cycle.
- **Serious infections (pneumonia, sepsis):** May be fatal. Do not use in those with an active infection. Use caution in patients with a history of extensive or intensive chemotherapy, as they may be at higher risk for life-threatening infections, monitor for dyspnea, cough, characteristics of sputum.
- **Fatal hepatic toxicity:** Monitor LFTs before the start of each cycle. Those with signs of hepatic disease may require dose modification or discontinuation.
- **Tumor lysis syndrome (TLS):** Those with high tumor burden or advanced-stage disease are at greater risk for development of TLS; consider tumor lysis prophylaxis with antihyperuricemic agents and hydration beginning 12-24 hr before treatment; for TLS treatment, administer aggressive IV hydration, antihyperuricemic agents, correct electrolyte abnormalities, and monitor renal function
- **Pregnancy and breastfeeding:** Consider discontinuing breastfeeding, identify whether the patient is pregnant before using, do not use if pregnant
- **Anaphylaxis, infusion site reactions:** Angioedema, rash, pruritus, wheezing; if these occur, stop infusion immediately and notify prescriber
- **Renal studies:** Monitor BUN/creatinine periodically, if renal disease is present use cautiously

### Patient/family education

- Teach patient to avoid use in breastfeeding, and not to use in pregnancy, fertility may be impaired
- Advise patient to report infusion-site reactions, rash, severe constipation or diarrhea, abdominal pain, nausea, vomiting

- **Bleeding:** Teach patient to report bruising, bleeding
- **Tumor lysis syndrome:** Teach patient to report fatigue, dark urine, nausea, weakness, confusion, change in heart rate
- **Infection:** Teach patient to report sore throat, cough, trouble breathing
- **Hepatic toxicity:** Teach patient to report dark urine, anorexia, yellow skin/eyes, itching, abdominal pain
- That compliance is needed with product and lab testing

### Evaluation

**Positive therapeutic outcome**

- Prevention of spread of disease

## benazepril (Rx)

(ben-a'za-pril)

**Lotensin**

*Func. class.:* Antihypertensive

*Chem. class.:* ACE inhibitor

**Do not confuse:** benazepril/Benadryl

**ACTION:** Selectively suppresses renin-angiotensin-aldosterone system; inhibits ACE, preventing conversion of angiotensin I to angiotensin II

**Therapeutic outcome:** Decreased B/P in hypertension

**USES:** Hypertension, alone or in combination with thiazide diuretics

**Unlabeled uses:** HF

## CONTRAINDICATIONS

Breastfeeding, children, hypersensitivity to ACE inhibitors, hereditary angioedema

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Impaired renal/liver function, dialysis patients, hypovolemia, blood dyscrasias, HF, COPD, asthma, geriatric, bilateral renal artery stenosis

## DOSAGE AND ROUTES

**Adult:** PO 10 mg daily initially, then 20-40 mg/day divided bid or daily (without a diuretic); 5 mg PO daily (with a diuretic); max 80 mg daily

**Geriatric:** PO based on clinical response

### Renal dose

**Adult:** PO 5 mg daily with CCr <30 ml/min or CCr >3 mg/d/use; increase as needed to max of 40 mg/day

**Available forms:** Tabs 5, 10, 20, 40 mg

### Implementation

- Store in airtight container at 86° F (30° C) or less
- Severe hypotension may occur after 1st dose of this medication; decreased hypotension may be prevented by reducing or discontinuing diuretic therapy 3 days before beginning benazepril therapy
- Storage in tight container at 86° F (30° C) or less

## ADVERSE EFFECTS

**CNS:** Anxiety, hypertonia, insomnia, paresthesia, headache, dizziness, fatigue

**CV:** Hypotension, postural hypotension, syncope, palpitations, angina

**GI:** Nausea, constipation, vomiting, gastritis, diarrhea, melena, hepatotoxicity, pancreatitis

**GU:** Increased BUN, creatinine, decreased libido, impotence, urinary tract infection, renal insufficiency

**HEMA:** Agranulocytosis, neutropenia

**INTEG:** Rash, flushing, sweating, alopecia

**META:** Hyperkalemia, hyponatremia

**MISC:** Angioedema, Stevens-Johnson syndrome, hypersensitivity

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | <40% |
| **Distribution** | Unknown; crosses placenta |
| **Metabolism** | Liver metabolites; protein binding 97% |
| **Excretion** | Kidney, breast milk (minimal) |
| **Half-life** | 10-11 hr (metabolite); increased in renal disease |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | ½-1 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol: increased hypotension (large amounts)

AzaTHIOprine: increased myelosuppression

Digoxin, lithium: increased serum levels, may cause toxicity, monitor lithium or digoxin levels

Increase: Hypotension, hyperkalemia in diabetes, renal disease; aliskiren, do not use in diabetes, avoid use in GFR<60 ml/min

### Drug classifications

Antihypertensives, diuretics, nitrates, phenothiazines: increased hypotension

Diuretics (potassium-sparing), potassium supplements: increased hyperkalemia, monitor potassium, BUN, creatinine

NSAIDs: decreased hypotensive effects, may need to reduce dose, monitor B/P

### Drug/herb

Ephedra (Ma huang), avoid concurrent use: decreased antihypertensive effect

Hawthorn: increased antihypertensive effect

### Drug/lab test

Increased: AST, ALT, alkaline phosphatase, bilirubin, uric acid, blood glucose, potassium, BUN, creatinine

## NURSING CONSIDERATIONS

### Assessment

- **Hypertension:** B/P, pulse baseline and periodically; monitor, check for orthostatic hypotension, syncope; if changes occur, dosage change may be required; notify prescriber of changes; monitor compliance
- **Monitor blood dyscrasias:** neutrophils, decreased platelets; WBC with differential at baseline, q3mo; if neutrophils $<1000/mm^3$, discontinue treatment
- Monitor renal studies: protein, BUN, creatinine; watch for increased levels that may indicate nephrotic syndrome and renal failure; monitor urine for protein; monitor renal symptoms: polyuria, oliguria, frequency, dysuria
- Establish baselines in renal, liver function tests before therapy begins
- Check potassium levels throughout treatment, although hyperkalemia rarely occurs; diuretic should be discontinued 3 days prior to initiation with benazepril; if hypertension is not controlled, a diuretic can be added; measure B/P at peak 2-4 hr and trough (before next dose); this product is less effective in African-American descendants

**BLACK BOX WARNING:** Pregnancy/breastfeeding: Identify if pregnancy is planned or suspected, do not use in pregnancy, breastfeeding

- **Assess for allergic reactions:** rash, fever, pruritus, urticaria; product should be discontinued if antihistamines fail to help; angioedema, Stevens-Johnson syndrome is more common in African-American descendants

### Patient/family education

- Instruct patient not to discontinue product abruptly; advise patient to tell all persons associated with care
- Teach patient not to use OTC products (cough, cold, allergy) unless directed by prescriber; serious side effects can occur; xanthines such as coffee, tea, chocolate, cola can prevent action of product
- Emphasize the importance of complying with dosage schedule, even if feeling better; to continue with medical regimen to decrease B/P: exercise, cessation of smoking, decreasing stress, diet modifications
- Emphasize the need to rise slowly to sitting or standing position to minimize orthostatic hypotension, not to exercise in hot weather because increased hypotension can occur
- Teach patient to notify prescriber of mouth sores, sore throat, fever, swelling of hands or feet, irregular heartbeat, chest pain, coughing, shortness of breath, bruising, bleeding, swelling of face, tongue, lips, difficulty breathing, signs of infection, cough
- Caution patient to report excessive perspiration, dehydration, vomiting, diarrhea; may lead to fall in B/P, strenuous exercise; to consume adequate fluids
- Instruct patient to use caution in hot weather
- Caution patient that product may cause dizziness, fainting, light-headedness; may occur during first few days of therapy; to avoid activities that may be hazardous
- Teach patient how to take B/P; teach normal readings for age group; ensure patient takes own B/P

**BLACK BOX WARNING:** Advise patient to notify prescriber of pregnancy, product will need to be discontinued

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P in hypertension

## TREATMENT OF OVERDOSE:

0.9% NaCl **IV** inf, hemodialysis

**RARELY USED**

## bendamustine (Rx)

(ben-da-muss'teen)

**Bendeka, Treanda**

*Func. class.:* Antineoplastic alkylating agent

*Chem. class.:* Nitrogen mustard

**Therapeutic outcome:** Improvement in blood counts and morphology

## USES:

Chronic lymphocytic leukemia, non-Hodgkin's lymphoma

## CONTRAINDICATIONS

Pregnancy, fetal harm may occur; hypersensitivity to this product or mannitol, children, hepatic disease, renal impairment, breastfeeding

## DOSAGE AND ROUTES

### Chronic lymphocytic leukemia

**Adult: IV** inf 100 $mg/m^2$ over 30 min on days 1, 2, q28days up to 6 cycles

### Non-Hodgkin's lymphoma
**Adult:** **IV** inf 120 mg/m$^2$ over 60 min on days 1, 2, q21days up to 8 cycles

### Renal/hepatic dose
**Adult:** IV inf CCr <40 ml/min, do not use; AST or ALT 2.5-10 × upper limit normal (ULN) or bilirubin 1.5-3 × ULN, do not use

**Available forms:** Powder for inj 25, 100 mg; solution for injection 100 mg/4 ml

### Implementation
- Give allopurinol for 1-2 wk to those at high risk for tumor lysis syndrome; usually develops in first treatment cycle
- Give blood transfusions; or RBC colony-stimulating factors to counter anemia unless cure is the intent
- Give antiemetic 30-60 min before giving product to prevent vomiting
- Give all medications PO, if possible avoid IM inj if platelets are <100,000/mm$^3$

## benzocaine topical
*See Appendix B*

## benztropine (Rx)
(benz'troe-peen)
**Cogentin**
*Func. class.:* Cholinergic blocker, antiparkinson agent
*Chem. class.:* Tertiary amine

**Do not confuse:** benztropine/bromocriptine

**ACTION:** Blockade of central acetylcholine receptors in the CNS; neurotransmitters are balanced, balances cholinergic activity

**Therapeutic outcome:** Decreased involuntary movements

**USES:** Parkinsonian symptoms, EPS associated with neuroleptic products, acute dystonia

**Unlabeled Uses:** Hypersalivation

## CONTRAINDICATIONS
Hypersensitivity, closed-angle glaucoma, dementia, tardive dyskinesia

**Precautions:** Pregnancy, breastfeeding, children, geriatric, tachycardia, renal/hepatic disease, product abuse history, dysrhythmias, hypo/hypertension, psychosis; myasthenia gravis, GI/GU obstruction, child ≤3 yr, peptic ulcer, megacolon, prostate hypertrophy

## DOSAGE AND ROUTES
### Drug-induced extrapyramidal symptoms
**Adult:** IM/IV 1-4 mg daily/bid; give PO dose as soon as possible; PO 1-2 mg bid/tid; increase by 0.5 mg q5-6days
**Child >3 yr:** IM/IV 0.02-0.05 mg/kg/dose 1-2 ×/day
**Geriatric:** PO 0.5 mg daily-bid, increase by 0.5 mg q5-6days; max 4 mg/day

### Parkinsonian symptoms
**Adult:** PO 1-2 mg daily, in 1-2 divided doses; increased 0.5 mg q5-6days titrated to patient response; max 6 mg daily

### Postencephalitic parkinsonism
**Adult:** PO/IM/IV 2 mg qday in one dose or divided, max 6 mg qday

### Acute dystonic reactions
**Adult:** IM/IV 1-2 mg, may increase to 1-2 mg bid (PO)

**Available forms:** Tabs 0.5, 1, 2 mg; inj 1 mg/ml (2-mg ampules)

### Implementation
**PO route**
- Give with or after meals to prevent GI upset; may give with fluids other than water; hard candy, frequent drinks, gum to relieve dry mouth
- Give at bedtime to avoid daytime drowsiness in patient with parkinsonism
- May be crushed and mixed with food
- Store at room temperature

**IM route**
- Inject deeply in muscle; use filtered needle to remove solution from ampule
- Give in large muscle mass for dystonic symptoms

**IV direct route**
- Use in emergencies, not used often

**Y-site compatibilities:** Alfentanil, amikacin, aminophylline, ascorbic acid injection, atracurium, atropine, azaTHIOprine, aztreonam, bumetanide, buprenorphine, butorphanol, calcium chloride, gluconate, ceFAZolin, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chlorproMAZINE, cimetidine, clindamycin, cyanocobalamin, cycloSPORINE, dexamethasone, digoxin, diphenhydrAMINE, DOBUTamine, DOPamine, Doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epoetin alfa, erythromycin lactobionate, esmolol, famotidine, fentaNYL, fluconazole, folic acid (as sodium salt), gentamicin, glycopyrrolate, heparin, hydrocortisone sodium succinate, hydrOXYzine,

imipenem-cilastatin, inamrinone, insulin, regular, isoproterenol, ketorolac, labetalol, lactated Ringer's, lidocaine, magnesium sulfate, mannitol, meperidine, metaraminol, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, midazolam, minocycline, morphine, multiple vitamins injection, nafcillin, nalbuphine, naloxone, netilmicin, nitroglycerin, nitroprusside, norepinephrine, ondansetron, oxacillin, oxytocin, papaverine, penicillin G potassium, sodium, pentamidine, pentazocine, PHENobarbital, phentolamine, phenylephrine, phytonadione, piperacillin, polymyxin B, potassium chloride, procainamide, prochlorperazine, promethazine, propranolol, protamine, pyridoxine, quiNIDine, raNITIdine, Ringer's injection, sodium bicarbonate, succinylcholine, SUFentanil, tacrolimus

## ADVERSE EFFECTS

**CNS:** Confusion; anxiety, restlessness, irritability, delusions, hallucinations, headache, sedation, depression, incoherence, dizziness, memory loss; delirium (geriatric)
**CV:** Palpitations, tachycardia, hypotension, bradycardia
**EENT:** Blurred vision, photophobia, dilated pupils, difficulty swallowing
**GI:** *Dryness of mouth, constipation,* nausea, vomiting, abdominal distress, paralytic ileus
**GU:** Hesitancy, retention, dysuria
**INTEG:** Rash, urticaria, dermatoses
**MISC:** Increased temperature, flushing, decreased sweating, hyperthermia, heat stroke, numbness of fingers

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Good (PO, IM), complete (**IV**) |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Unknown |

### Pharmacodynamics

| | IM/IV | PO |
|---|---|---|
| **Onset** | 15 min | 1 hr |
| **Peak** | 7 hr | Unknown |
| **Duration** | 6-10 hr | 6-24 hr |

## INTERACTIONS

### Individual drugs

Bethanechol: decreased cholinergic effects
Disopyramide, quiNIDine: increased anticholinergic 5 effects, reduce dose, monitor response

### Drug classifications

Antidepressants (tricyclic), antihistamines, phenothiazines: increased anticholinergic amantadine effects
Antidiarrheals, antacids: decreased absorption

## NURSING CONSIDERATIONS

### Assessment

- Assess for **parkinsonism**, EPS: shuffling gait, muscle rigidity, involuntary movements, loss of balance, pill rolling, muscle spasms, drooling before and during treatment, tardive dyskinesia (TD), do not use in TD, exacerbation of symptoms may occur
- **Paralytic ileus:** assess for abdominal pain, intermittent constipation/diarrhea
- Monitor I&O ratio; retention commonly causes decreased urinary output, distention, frequency, incontinence
- Monitor for urinary hesitancy, retention; palpate bladder if retention occurs
- Monitor for constipation, cramping, pain in abdomen, abdominal distention; increase fluids, bulk, exercise if this occurs
- Assess for tolerance over long-term therapy; dosage may have to be increased or changed
- Assess for mental status: affect, mood, CNS depression, worsening of mental symptoms during early therapy
- Assess for benztropine "buzz" or "high," patients may imitate EPS
- Do not discontinue abruptly, taper
- **Pregnancy/breastfeeding:** Safe use is not established, antimuscarinic products inhibit lactation, excretion in breast milk is unknown
- **Beers:** Avoid in older adults, high risk of delirium, CNS effects, decreased urinary flow

### Patient/family education

- Teach patient to report urinary hesitancy/retention, dysuria
- Teach patient to use caution in hot weather; product may increase susceptibility to stroke since perspiration is decreased; patient should remain indoors
- Advise patient not to discontinue this product abruptly; to taper off over 1 wk to prevent withdrawal symptoms (insomnia, involuntary movements, anxiety, tachycardias), to take as directed, not to double doses
- Advise patient that tabs may be crushed, mixed with food; may take whole dose at bedtime if approved by prescriber
- Caution patient to avoid driving or other hazardous activities; drowsiness, dizziness may occur
- Teach patient to avoid OTC medication: cough, cold preparations with alcohol, antihistamines, antacids, or antidiarrheals within 2 hr

unless directed by prescriber; increased CNS depression may occur
• Teach patient to avoid strenuous exercise or activities in hot weather, overheating may occur
• Advise patient to rise from sitting or recumbent position slowly to minimize orthostatic hypotension
• Teach patient to use good oral hygiene; to use sugarless gum, hard candy, frequent sips of water to decrease dry mouth; if dry mouth continues, saliva substitutes may be prescribed
• Instruct patient that doses should not be doubled, but missed dose may be taken up to 2 hr before next dose

### Evaluation

**Positive therapeutic outcome**

• Absence of involuntary movements (pill rolling, tremors, muscle spasms) after 2 days of treatment

## betamethasone topical

*See Appendix B*

## betamethasone (augmented) topical

*See Appendix B*

## betaxolol ophthalmic

*See Appendix B*

**⚠ HIGH ALERT**

## bevacizumab (Rx)

(beh-va-kiz′you-mab)

**Avastin**

*Func. class.:* Antineoplastic—miscellaneous

*Chem. class.:* Monoclonal antibody

**Do not confuse:** Avastin/Astelin

**ACTION:** Monoclonal antibody selectively binds to and inhibits activity of human vascular endothelial growth factor to reduce microvascular growth and inhibition of metastatic disease progression

**Therapeutic outcome:** Decreased tumor size

**USES:** Metastatic carcinoma of the colon or rectum in combination, renal cell carcinoma, glioblastoma, non–small cell lung cancer

**Unlabeled uses:** Adjunctive in breast, renal/ovarian cancer, (wet) macular degeneration

### CONTRAINDICATIONS

Hypersensitivity, serious bleeding, hypertensive crisis, recent surgery

**Precautions:** Pregnancy, breastfeeding, children, geriatric, HF, blood dyscrasias, CV disease, hypertension, surgery, thromboembolic disease, hamster protein/murine hypersensitivity

**BLACK BOX WARNING:** GI perforation, wound dehiscence, bleeding

### DOSAGE AND ROUTES

**Recurrent platinum-sensitive, epithelial, ovarian, fallopian tube, or primary peritoneal cancer with CARBOplatin and PACLitaxel**

**Adult: IV** 15 mg/kg with PACLitaxel (175 mg/m2 IV over 3 hr) and CARBOplatin (AUC 5 IV on day 1 and q3wk × 6-8 cycles), then bevacizumab 15 mg/kg IV q3wk as a single agent until disease progression or unacceptable toxicity

**Metastatic colorectal cancer**

**Adult: IV** INF in combination with 5-fluorouracil 5 mg/kg q14 days given over 90 min; if well tolerated, the next infusion may be given over 60 min; if 60 min infusions are well tolerated, subsequent infusions may be given over 30 min; (second-line) 5 mg/kg q2wk or 7.5 mg/kg q3wk with fluoropyrimidine and irinotecan or fluoropyrimidine and oxaliplatin-based agent

**Non–small cell lung cancer**

**Adult: IV** 15 mg/kg over 60-90 min with CARBOplatin and PAClitaxel

**Metastatic cervical cancer**

**Adult: IV** 15 mg/kg q3wk with paclitaxel and CISplatin or PACLitaxel and topotecan

**Metastatic renal cell carcinoma**

**Adult: IV** 15 mg/kg q2wk with interferon alfa 9 million units SUBCUT 3 × per wk, up to 52 wk

**Available forms:** Inj 25 mg/ml

### Implementation

**IV intermittent infusion route**

• Do not give by **IV** bolus or **IV** push, do not admix
• Give as **IV** inf over 90 min for first dose and 60 min thereafter, if well tolerated

**BLACK BOX WARNING: Wound dehiscence:** do not give for ≥28 days after surgery, make sure wounds are healed prior to use

### ADVERSE EFFECTS

**CNS:** *Asthenia, dizziness,* intracranial hemorrhage (malignant glioma), headache, fatigue, confusion, weakness

**CV:** Deep vein thrombosis, arterial thrombosis, hypo/hypertension, hypertensive crisis, heart failure
**GI:** Nausea, vomiting, anorexia, diarrhea, constipation, abdominal pain, colitis, taste change, dyspepsia, stomatitis, GI hemorrhage/perforation
**GU:** Proteinuria, urinary frequency/urgency, nephrotic syndrome, ovarian failure
**HEMA:** Leukopenia, neutropenia, thrombocytopenia, microangiopathic hemolytic anemia, thromboembolism, bleeding
**META:** Bilirubinemia, hypokalemia, hyponatremia
**MISC:** Exfoliative dermatitis, hemorrhage, non-GI fistula formation, *alopecia, impaired wound healing,* osteonecrosis of the jaw, antibody formation, back pain myalgia
**RESP:** Dyspnea, upper respiratory infection
**INTEG:** Skin discoloration, infusion reactions

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Steady state 100 days |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 20 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Steady state 100 days |

## INTERACTIONS

### Individual drugs

SUNItinib: avoid concurrent use; microangiopathic hemolytic anemia may occur

## NURSING CONSIDERATIONS

### Assessment

- Monitor B/P q3-4wk
- Assess for symptoms of infection; may be masked by product
- Monitor **CNS reaction:** dizziness, confusion
- Assess for **HF:** crackles, jugular vein distention, dyspnea during treatment
- Assess **GU status** (proteinuria); nephrotic syndrome may occur; monitor urinalysis for increasing protein level; products should be held if protein ≥2 g/24 hr

**BLACK BOX WARNING: Wound dehiscence:** discontinue 28 days before elective surgery, hold for ≥28 days until incision is healed

- Assess for GI perforation, serious bleeding, nephrotic syndrome, hypertensive crisis; GI perforation (constipation, fever, abdominal pain, nausea, vomiting)
- **Serious bleeding:** Assess for bleeding from any orifice, stroke, deep vein thrombosis, product should be discontinued permanently; for surgery, product should be discontinued temporarily
- **Reversible posterior leukoencephalopathy syndrome (RPLS):** discontinue if this disorder develops (headache, vision changes, seizures, altered mental status); MRI may be ordered, occurs 16 hr-1 yr after beginning treatment
- **Pregnancy/Breastfeeding:** Drug may lead to fetal harm, Do not use in pregnancy, do not breastfeed
- Thromboembolic events: Assess for stroke, TIA, MI, usually occurs in geriatric patients who used this product previously
- **Fistulas:** May occur within 6 mo of beginning treatment, may be fatal

### Patient/family education

- Instruct patient to avoid hazardous tasks, since confusion, dizziness may occur
- Instruct patient to report signs of infection: sore throat, fever, diarrhea, vomiting
- Advise patient not to become pregnant while taking this product, or for several months after discontinuing treatment
- Advise patient to notify prescriber if pregnant or planning a pregnancy, discuss possible infertility with patient
- Need to discontinue a month before surgery and not restart until wound is healed

**BLACK BOX WARNING:** Teach patient to report bleeding, changes in urinary patterns, edema, abdominal pain

### Evaluation

**Positive therapeutic outcome**

- Decrease in size of tumors

## bezlotoxumab

(bez'loe-tox'ue-mab)
**Zinplava**
*Func. class.:* Biologic response modifier, monoclonal antibody

**ACTION:** Binds to *Clostridium difficile* toxin B, inhibiting the binding of toxin B and neutralizing its effects

**Therapeutic outcome:** No recurrence when used with antibiotic therapy

**USES:** For pseudomembranous colitis to reduce recurrence of *C. difficile* infection (CDI) in patients who are receiving antibacterial

treatment of CDI and are at a high risk for CDI recurrence

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Breastfeeding, pregnancy, heart failure

## DOSAGE AND ROUTES:

**Adult: IV** 10 mg/kg IV as a single dose during antibacterial treatment for CDI

**Available forms:** Solution for injection 1000 mg/40 ml

## IMPLEMENTATION

- Give by IV infusion, visually inspect parenteral products for particulate matter and discoloration prior to use
- Dilution of the vials: Do not shake, withdraw the required volume from the vial based on the patient's weight and transfer into an IV bag of either 0.9% NaCl or D5 injection to 1-10 mg/ml. Mix the diluted solution by gentle inversion, do not shake
- Storage: The diluted solution may be stored at room temperature for 16 hr or refrigerated 2-8° C (36-46° F) up to 24 hr; if refrigerated, allow the solution to come to room temperature before use, do not freeze

**Intravenous (IV) infusion:** Infuse the diluted solution IV over 60 min using a sterile, nonpyrogenic, low-protein–binding 0.2-0.5 micron inline or add-on filter, give via a central line or a peripheral catheter, do not give IV push or bolus, do not coadminister other drugs simultaneously through the same infusion line

## ADVERSE EFFECTS

**CNS:** Fever, headache, dizziness, fatigue
**CV:** Ventricular tachycardia, heart failure, hypertension
**Misc:** *Infusion-related reactions,* nausea, dyspnea, antibody formation

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Catabolism |
| **Half-life** | 19 days |

### Pharmacodynamics

Unknown

## INTERACTIONS

None known

## NURSING CONSIDERATIONS

### Assessment

- **Pseudomembranous colitis:** Assess for diarrhea that is watery or bloody, fever, abdominal cramping/pain, pus or mucus in the stools, dehydration
- **Heart failure:** Monitor for heart failure during administration, death has occurred from heart failure; causes of death included infections, cardiac failure, and respiratory failure
- Pregnancy/breastfeeding: Identify if the patient is pregnant or breastfeeding, there are no adequate and well-controlled studies in pregnancy or breastfeeding
- Infusion-related reactions: Monitor for infusion-related reactions, redness, swelling; if these occur, infusion should be discontinued

### Evaluation

**Positive therapeutic outcome**
No recurrence when used with antibiotic therapy

### Patient/family education

- Advise on the reason for product and expected result
- **Pseudomembranous colitis:** Teach patient to report immediately diarrhea that is watery or bloody, fever, abdominal cramping/pain, pus or mucus in the stools, dehydration
- **Infusion-related reactions:** Teach patient to report immediately infusion-related reactions, redness, swelling; if these occur, infusion should be discontinued

## bimatoprost ophthalmic

*See Appendix B*

## bisacodyl (Rx, OTC)

(bis-a-koe'dill)
**Alophen, Bicholate, Carter's Little Pills, Codulax, Dacodyl, Doxidan, Dulcolax, Ex-Lax Ultra Tab, Femilax, Fleet (bisacodyl), Feen-A-Mint, Soflax-Ex**
*Func. class.:* Laxative, stimulant
*Chem. class.:* Diphenylmethane

**Do not confuse:** Dulcolax (bisacodyl), Dulcolax (docusate)

**ACTION:** Acts directly on intestine by increasing motor activity; thought to irritate colonic intramural plexus; increases water in the colon

**Therapeutic outcome:** Decreased constipation

**USES:** Short-term treatment of constipation, bowel or rectal preparation for surgery, examination

## CONTRAINDICATIONS

Hypersensitivity, abdominal pain, nausea, vomiting, appendicitis, acute surgical abdomen, ulcerated hemorrhoids, acute hepatitis, fecal impaction, intestinal/biliary tract obstruction

**Precautions:** Pregnancy, breastfeeding, rectal fissures, severe CV disease

## DOSAGE AND ROUTES

**Adult ≥12 yr:** PO 5-15 mg in PM or AM; may use up to 30 mg for bowel or rectal preparation; RECT 10 mg (single dose), 30 ml enema
**Child 6-11 yr:** PO 5 mg as a single dose; RECT 5 mg as a single dose

**Available forms:** Tabs del rel 5, 10 mg; enteric-coated tabs 5 mg; supp 5, 10 mg; enema 10 mg/30 ml

### Implementation

**Oral route**

- Swallow tabs whole; do not break, crush, or chew
- Give alone with water only for better absorption; do not take within 1 hr of antacids, milk
- Administer in AM or PM (oral dose)

**Rectal route**

- Lubricate before insertion, patient should retain for ½ hr
- Insert high in rectum

## ADVERSE EFFECTS

**CNS:** Muscle weakness
**GI:** *Nausea, vomiting, anorexia, cramps,* diarrhea, rectal burning (supp)
**META:** Protein-losing enteropathy, alkalosis, hypokalemia, tetany, electrolyte and fluid imbalances

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Poor |
| **Distribution** | Unknown |
| **Metabolism** | Liver, minimally |
| **Excretion** | Kidneys |
| **Half-life** | Unknown |

### Pharmacodynamics

| | PO | Rect |
|---|---|---|
| **Onset** | 6-10 hr | 15-60 min |
| **Peak** | Unknown | Unknown |
| **Duration** | Unknown | Unknown |

## INTERACTIONS

### Drug classifications

Antacids, gastric acid pump inhibitors, $H_2$-blockers: increased gastric irritation

### Drug/food

Increased irritation—dairy products: separate by 2 hr

### Drug/lab test

Increased: sodium phosphate
Decreased: calcium, magnesium

### Drug/herb

Flax, lily of the valley, pheasant's eye, senna, squill: increased laxative action

## NURSING CONSIDERATIONS

### Assessment

- Monitor blood, urine electrolytes if used often by patient; check I&O ratio to identify fluid loss
- Assess **GI symptoms:** cramping, rectal bleeding, nausea, vomiting; if these symptoms occur, product should be discontinued; identify cause of constipation; identify whether fluids, bulk, or exercise are missing from lifestyle
- Multiple products/routes may be used for bowel prep
- **Pregnancy/breastfeeding:** Safety not determined, may be used in breastfeeding

### Patient/family education

- Discuss with the patient that adequate fluid and bulk consumption is necessary
- Advise patient that normal bowel movements do not always occur daily
- Teach patient not to use in presence of abdominal pain, nausea, vomiting; tell patient to notify prescriber if constipation is unrelieved or if symptoms of electrolyte imbalance occur: muscle cramps, pain, weakness, dizziness, excessive thirst
- Teach patient to take with a full glass of water; take with dairy products, separate by 2 hr; separate from other foods by 1 hr
- Teach patient to identify bulk, water, constipating products, exercise in patient's life
- Instruct patient not to use laxatives for long-term therapy because bowel tone will be lost; 1 wk use is usually sufficient

### Evaluation

**Positive therapeutic outcome**

- Decreased constipation within 3 days

## bismuth subsalicylate (OTC)

(bis'meth sub-sa-li'si-late)
**Bismatrol, Bismed, Bismylate, Kaopectate, Kaopectolin, Kao-Tin, K-Pek, Maalox Total Stomach Relief, Peptic Relief, Pepto-Bismol, Pink Bismuth, StomaK-care**
*Func. class.:* Antidiarrheal/weak antacid
*Chem. class.:* Salicylate

**ACTION:** Inhibits prostaglandin synthesis responsible for GI hypermotility, intestinal inflammation; stimulates absorption of fluid and electrolytes; binds toxins produced by *Escherichia coli*

**Therapeutic outcome:** Absence of loose, watery stools

**USES:** Diarrhea (cause undetermined); prevention of diarrhea when traveling; may be included to treat *Helicobacter pylori,* heartburn, indigestion, nausea

**Unlabeled uses:** Chronic infantile diarrhea, traveler's diarrhea, gastric/duodenal ulcer, *H. pylori* eradication

## CONTRAINDICATIONS

Child <3 yr; flulike symptoms; history of GI bleeding; varicella, hypersensitivity to this product or salicylates, PUD

**Precautions:** Pregnancy, breastfeeding, geriatric, gout, diabetes mellitus, bleeding disorders, previous hypersensitivity to NSAIDs, *Clostridium difficile*–associated diarrhea when used with antiinfectives for *H. pylori*

## DOSAGE AND ROUTES

### Antidiarrheal

**Adult:** PO 2 tab or 30 ml/15 ml extra/max strength q30min or 2 tabs q6min, max 4.2 g/24 hr

### Antiulcer

**Adult:** PO 524 mg q30-60min or 1048 mg q1hr, max 4.2 g/24 hr; given with metroNIDAZOLE or tetracycline

### Traveler's diarrhea (Unlabeled)

**Adult: PO** 30 ml q30min (8 times/day regular strength) (4 times/day max strength)

**Available forms:** Tabs 262 mg; chewable tabs 262 mg/15 ml, liquid 262 mg/15 ml, 525 mg/ml

### Implementation

- **Suspension:** Shake susp before use; chewable tabs should not be swallowed whole, use measuring cup/syringe

## ADVERSE EFFECTS

**CNS:** Confusion, twitching, neurotoxicity (high dose)
**EENT:** Hearing loss, tinnitus, metallic taste, blue gums, black tongue (chew tabs)
**GI:** Increased fecal impaction (high doses), dark stools, constipation, diarrhea, nausea
**HEMA:** Increased bleeding time

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Salicylate >90% |
| **Distribution** | None |
| **Metabolism** | None |
| **Excretion** | Feces (unchanged) |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 1 hr |
| **Peak** | 2 hr |
| **Duration** | 4 hr |

## INTERACTIONS

### Individual drugs

Methotrexate: increased toxicity
Tetracycline: decreased absorption, phenytoin, separate by ≥2 hr
Increase: effect of anticoagulants (PO), antidiabetics (PO)

### Drug classifications

Anticoagulants (oral): increased effect of anticoagulants
Quinolones: decreased absorption of quinolones
Salicylates: increased risk of salicylate toxicity

### Drug/lab test

Interference: radiographic studies of GI system

## NURSING CONSIDERATIONS

### Assessment

- **Diarrhea:** Assess bowel pattern (frequency, consistency, shape, volume, color) before product therapy, after treatment; check weight, bowel sounds; identify factors contributing to diarrhea (bacteria, diet, medications, tube feedings)
- Monitor skin turgor; dehydration may occur in severe diarrhea; monitor electrolytes (potassium, sodium, chloride) if diarrhea is severe or continues long term
- **Pregnancy/breastfeeding:** Avoid in pregnancy, do not use in breastfeeding

### Patient/family education

- Teach patient to stop use if symptoms do not improve within 2 days or become worse, or if diarrhea is accompanied by high fever
- Teach patient to increase fluids for rehydration
- Tell patient to chew or dissolve chewable tabs in mouth; do not swallow whole; shake susp before using, maintain hydration
- Tell patient to avoid other salicylates unless directed by prescriber; not to give to children because of possibility of Reye's syndrome
- Tell patient that stools may turn gray; tongue may darken; impaction may occur in debilitated patients
- Separate quinolones, phenytoin, tetracycline by ≥ 2 hrs

### Evaluation
**Positive therapeutic outcome**
• Decreased diarrhea or absence of diarrhea when traveling; resolution of ulcers

**⚠ HIGH ALERT**

## bisoprolol (Rx)
(bis-oh′pro-lole)
**Monocor**
*Func. class.:* Antihypertensive
*Chem. class.:* $\beta_1$-Blocker (selective)

**Do not confuse:** Zebeta/Diabeta/Zetia

**ACTION:** Preferentially and competitively blocks stimulation of $\beta_1$-adrenergic receptor within cardiac muscle (decreases rate of SA node discharge, increases recovery time), slows conduction of AV node, decreases heart rate, which decreases $O_2$ consumption in myocardium; decreases renin-aldosterone-angiotensin system; inhibits $\beta_2$-receptors in bronchial and vascular smooth muscle at high doses

**Therapeutic outcome:** Decreased B/P, heart rate

**USES:** Mild to moderate hypertension

**Unlabeled uses:** Stable angina, stable HF for heart control in atrial fibrillation/flutter

## CONTRAINDICATIONS
Hypersensitivity to β-blockers, cardiogenic shock, heart block (2nd or 3rd degree), sinus bradycardia, acute cardiac failure

**Precautions:** Pregnancy, breastfeeding, children, major surgery, diabetes mellitus, HF, renal/hepatic/thyroid/peripheral vascular/aortic/mitral valve disease, COPD, asthma, well-compensated heart failure, myasthenia gravis, abrupt discontinuation

## DOSAGE AND ROUTES
### Renal/hepatic dose
**Adult:** PO CCr <40 ml/min 2.5 mg, titrate upward

### Hypertension
**Adult:** PO 2.5-5 mg/day, may increase if necessary to 20 mg once daily, max 20 mg/day; reduce to 2.5 mg in bronchospastic disease

### Angina (unlabeled)
**Adult:** PO 5-20 mg/day

### Heart failure (unlabeled)
**Adult:** PO 1.25 mg/day × 48 hr, then 2.5 mg/day for 1st mo, then 5 mg/day, max 10 mg/day

**Available forms:** Tabs 5, 10 mg

### Implementation
• Give daily; give with food to prevent GI upset; may be crushed
• Store protected from light, moisture; place in cool environment

## ADVERSE EFFECTS
**CNS:** Headache, insomnia, fatigue, dizziness, mental changes, memory loss, hallucinations, depression, lethargy, drowsiness, strange dreams, catatonia, peripheral neuropathy
**CV:** Ventricular dysrhythmias, profound hypotension, bradycardia, HF, cold extremities, postural hypotension
**EENT:** Sore throat, dry burning eyes, dry mouth
**GI:** Nausea, diarrhea, vomiting
**INTEG:** Sweating
**RESP:** Dyspnea, cough, upper respiratory infection

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Unknown; protein binding (30%) |
| **Metabolism** | Liver, inactive metabolites |
| **Excretion** | Urine, unchanged (50%) |
| **Half-life** | 9-12 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-4 hr |
| **Duration** | 24 hr |

## INTERACTIONS
### Individual drugs
Amiodarone, digoxin: increased bradycardia
Guanethidine, reserpine: increased hypotension

### Drug classifications
ACE inhibitors, α-blockers, calcium channel blockers, diuretics: increased antihypertensive effect
Antidiabetics: increased antidiabetic effect
Calcium channel blockers: increased myocardial depression
Ergots: increased peripheral ischemia
NSAIDs, salicylates: decreased antihypertensive effects, may mask hypoglycemic symptoms

### Drug/herb
Hawthorn: increased β-blocking effect
Ephedra: decreased β-blocking effect

### Drug/lab test
Increased: AST, ALT, blood glucose, BUN, uric acid, potassium, lipoprotein, ANA titer
Interference: glucose/insulin tolerance tests

## NURSING CONSIDERATIONS

### Assessment

- **Hypertension:** Monitor B/P during beginning treatment, periodically thereafter; pulse: note rate, rhythm, quality; apical/radial pulse before administration; notify prescriber of any significant changes (pulse <50 bpm)
- Check for baselines in renal, liver function tests before therapy begins
- **HF:** assess for edema in feet, legs daily, monitor I&O, daily weight; check for jugular vein distention, crackles, bilaterally, dyspnea
- Monitor skin turgor, dryness of mucous membranes for hydration status, especially geriatric
- **Pregnancy/breastfeeding:** Use in pregnancy only if benefits outweigh fetal risk, cautious use in breastfeeding

### Patient/family education

**BLACK BOX WARNING:** Teach patient not to discontinue product abruptly, taper over 1 wk; may cause precipitate angina if stopped abruptly; evaluate noncompliance

- Teach patient not to use OTC products containing α-adrenergic stimulants (such as nasal decongestants, cold preparations); to avoid alcohol, smoking; to limit sodium intake as prescribed
- Teach patient how to take pulse and B/P at home; advise when to notify prescriber
- Instruct patient to comply with weight control, dietary adjustments, modified exercise program
- Tell patient to carry/wear emergency ID to identify product being taken, allergies; tell patient product controls symptoms but does not cure
- Caution patient to avoid hazardous activities if dizziness, drowsiness present
- Teach patient to take product as prescribed, not to double doses, skip doses; take any missed doses as soon as remembered if at least 8 hr until next dose
- Advise patient to report slow heart rate dizziness, confusion, depression, fever, cold extremities
- Teach diabetic patient drug may mask signs of hypoglycemia or alter blood glucose levels

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P in hypertension (after 1-2 wk)

## TREATMENT OF OVERDOSE:

Lavage, **IV** atropine for bradycardia, **IV** theophylline for bronchospasm, digoxin, $O_2$, diuretic for cardiac failure, hemodialysis, **IV** glucose for hypoglycemia, **IV** diazePAM (or phenytoin) for seizures

**⚠ HIGH ALERT**

# bivalirudin (Rx)

(bye-val-i-rue'din)

**Angiomax**

*Func. class.:* Anticoagulant

*Chem. class.:* Thrombin inhibitor

**ACTION:** Direct inhibitor of thrombin that is highly specific; able to inhibit free and clot-bound thrombin

**Therapeutic outcome:** Anticoagulation in percutaneous transluminal coronary angioplasty (PTCA), used with aspirin; heparin-induced thrombocytopenia with thrombosis syndrome

**USES:** Unstable angina in patients undergoing PTCA, used with aspirin; heparin-induced thrombocytopenia; heparin-induced thrombocytopenia with thrombosis syndrome, PCI with IIb/IIIa

## CONTRAINDICATIONS

Hypersensitivity, active bleeding, cerebral aneurysm, intracranial hemorrhage, recent surgery, CVA

**Precautions:** Pregnancy, breastfeeding, children, geriatric, renal function impairment, hepatic disease, asthma, blood dyscrasias, thrombocytopenia, GI ulcers, hypertension, inflammatory bowel disease, vitamin K deficiency

## DOSAGE AND ROUTES

### PCI/PTCA

**Adult: IV** bol 0.75 mg/kg, then **IV** inf 1.75 mg/kg/hr for 4 hr; another **IV** inf may be used at 0.2 mg/kg/hr for ≤20 hr; this product is intended to be used with aspirin (325 mg daily) adjusted to body weight

### HIT/HITTS

**Adult: IV** bol 0.75 mg/kg, then cont INF 1.75 mg/kg/hr for duration of procedure

### Renal dose

**Adult:** IV CCr ≥ 30 ml/min no change; CCr 10-29 ml/min consider reduction to 1 ml/kg/hr

**Available forms:** Inj, lyophilized 250 mg vial

### Implementation

- Prior to PTCA, give with aspirin, 325 mg **IV** direct 1 mg/kg as a bolus; then intermittent infusion

**Intermittent IV infusion route**

- To each 250-mg vial add 5 ml of sterile water for inj, swirl until dissolved, further dilute reconstituted vial with 50 ml of $D_5W$ or 0.9% NaCl (5 mg/ml); the dose is adjusted to body weight, run at 2.5 mg/kg/hr, do not admix before or during administration
- Give reduced dose in renal impairment

**Y-site compatibilities:** Abciximab, acyclovir, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amphotericin B liposome, ampicillin, ampicillin-sulbactam, anidulafungin, argatroban, arsenic trioxide, atenolol, atracurium, atropine, azithromycin, aztreonam, bleomycin, bumetanide, buprenorphine, busulfan, butorphanol, calcium chloride/gluconate, capreomycin, CARBOplatin, carmustine, ceFAZolin, cefepime, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, cimetidine hydrochloride, ciprofloxacin, cisatracurium, CISplatin, clindamycin, cyclophosphamide, cycloSPORINE, cytarabine, dacarbazine, DACTINomycin, DAPTOmycin, DAUNOrubicin, DAUNOrubicin liposome, dexamethasone, dexmedetomidine, dexrazoxane, digoxin, dilTIAZem, diphenhydrAMINE, DOCEtaxel, dolasetron, DOPamine, DOXOrubicin, DOXOrubicin liposomal, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, epoprostenol, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, foscarnet, fosphenytoin, furosemide, gallium, ganciclovir, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, haloperidol, heparin, hydrALAZINE, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, inamrinone, insulin, irinotecan, isoproterenol, ketorolac, labetalol, leucovorin, levofloxacin, lidocaine, linezolid, LORazepam, magnesium, mannitol, mechlorethamine, melphalan, meperidine, meropenem, mesna, methohexital, methotrexate, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, mitoMYcin, mitoXANtrone, mivacurium, morphine, moxifloxacin, mycophenolate, nafcillin, nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ofloxacin, ondansetron, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, PEMEtrexed, PENTobarbital, PHENobarbital, phenylephrine, piperacillin, piperacillin-tazobactam, polymyxin B, potassium acetate/chloride/phosphates, procainamide, promethazine, propranolol, raNITIdine, remifentanil, rocuronium, sodium acetate/bicarbonate/phosphates, streptozocin, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, tacrolimus, teniposide, theophylline, thiopental, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, topotecan, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, voriconazole, warfarin, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CNS:** *Headache, insomnia, anxiety, nervousness*
**CV:** *Hypo/hypertension, bradycardia,* ventricular fibrillation
**GI:** *Nausea, vomiting, abdominal pain, dyspepsia*
**HEMA:** Hemorrhage, thrombocytopenia
**MISC:** Pain at inj site, pelvic pain, urinary retention, fever, anaphylaxis, infection
**MS:** *Back pain*
**GU:** Urinary retention, renal failure, oliguria

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | No protein binding |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys |
| **Half-life** | 25 min |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | 1 hr |

## INTERACTIONS

### Individual drugs

Aspirin, treprostinil: increased risk of bleeding, GPIIb/IIIa inhibitors, use together cautiously

### Drug classifications

Anticoagulants, thrombolytics: increased risk of bleeding, NSAIDs, salicylates, cephalosporins, antineoplastics, sulfinpyrazone

### Drug/herb

Angelica, chamomile, devil's claw, dong quai, garlic, ginger, ginkgo, ginseng, horse chestnut, saw palmetto, avoid concurrent use

## NURSING CONSIDERATIONS

### Assessment

- Assess for fall in B/P or Hct that may indicate hemorrhage, hematoma, hemorrhage at puncture site are more common in the elderly, monitor coagulation studies, Hct before use
- Assess for fever, skin rash, urticaria
- Assess **bleeding:** check arterial and venous sites, IM inj sites, catheters; all punctures should be minimized
- **PCI use:** assess for possible thrombosis, stenosis, unplanned stent, prolonged ischemia, decreased reflow
- **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding

### Patient/family education
- Explain reason for product and expected results
- Teach patient not to use other OTC products unless approved by prescriber
- Teach patient not to use hard-bristle toothbrush, regular razor to avoid any injury: hemorrhage may result

### Evaluation
**Positive therapeutic outcome**
- Anticoagulation in PTCA

**⚠ HIGH ALERT**

## bleomycin (Rx)
(blee-oh-mye'sin)
**Blenoxane** 🍁
*Func. class.:* Antineoplastic, antibiotic
*Chem. class.:* Glycopeptide

**ACTION:** Inhibits synthesis of DNA, RNA, protein; derived from *Streptomyces verticillus;* phase specific in the $G_2$ and M phases; a nonvesicant, sclerosing agent

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** Cancer of head, neck, penis, cervix, vulva of squamous cell origin, Hodgkin's/non-Hodgkin's disease, testicular carcinoma, as a sclerosing agent for malignant pleural effusion

## CONTRAINDICATIONS
Pregnancy, breastfeeding, hypersensitivity

**Precautions:** Renal/hepatic/respiratory disease, patients >70 yr old

**BLACK BOX WARNING:** Idiosyncratic reaction, pulmonary fibrosis, requires specialized care setting, experienced clinician

### Hodgkin's lymphoma
**Adult/adolescent/child:** IV, IM, SUBCUT 5-20 units/m2 may give in combination

## DOSAGE AND ROUTES
**Adult and child:** IM/SUBCUT/**IV** 0.25-0.5 units/kg q1-2wk or 10-20 units/$m^2$; then 1 unit/day or 5 units/wk; may also be given by cont INF; max total dose, 400 units in lifetime

### Hodgkin's disease (test dose)
**Adult and child (unlabeled):** IM/**IV**/SUBCUT <2 units for first 2 doses followed by 24 hr observation

### Malignant pleural effusion
**Adult:** 60 units diluted in 100 ml of 0.9% NaCl intrapleural inj given through a thoracotomy tube following drainage of excess pleural fluid and complete lung expansion, remove after 4 hr

### Testicular cancer
**Adult:** IV 10-20 units/m2 q1-2 × 1wk, may be given in combination

### Renal Dose
**Adult/child:** CCr 40-50 ml/min reduce dose by 30%; CCr 30-39 ml/min reduce dose by 40%; CCr 20-29 ml/min reduce dose by 45%; CCr 10-19 ml/min reduce dose by 55%; CCr 5-10 ml/min reduce dose by 60%

**Available forms:** Powder for inj 15, 30 units/vial

### Implementation
- Avoid contact with skin; very irritating; wash completely to remove
- Give fluids **IV** or PO before chemotherapy to hydrate patient
- Give antacid before oral agent; give antiemetic 30-60 min before giving product and prn to prevent vomiting; give antibiotics for prophylaxis of infection
- Provide liquid diet: carbonated beverages, gelatin may be added if patient is not nauseated or vomiting
- Rinse mouth tid-qid with water, club soda; brush teeth bid-qid with soft brush or cotton-tipped applicators for stomatitis; use unwaxed dental floss

**IM/SUBCUT route**
- IM test dose in lymphoma
- Reconstitute with 1-5 ml sterile water for inj; max conc 5 units/ml, $D_5W$, 0.9% NaCl, rotate inj sites

**IV route**
- Product should be prepared by experienced personnel using proper precautions
- Two test doses 2-5 units before initial dose in lymphoma; monitor for anaphylaxis
- Give by direct **IV** after reconstituting 15- or 30-unit vial with 5 or 10 ml of 0.9% NaCl; give 15 units or less/10 min through Y-tube or 3-way stopcock initial dose; monitor for anaphylaxis

**Intermittent IV infusion route**
- Administer after diluting 50-100 ml 0.9% NaCl, $D_5W$ and giving at prescribed rate

**Y-site compatibilities:** Acyclovir, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amiodarone, ampicillin, ampicillin-sulbactam, anidulafungin, atenolol, atracurium, azithromycin, aztreonam, bivalirudin, bumetanide, buprenorphine, busulfan, butorphanol, calcium chloride/gluconate, CARBOplatin, carmustine, caspofungin, ceFAZolin, cefepime, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime,

chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, codeine, cyclophosphamide, cycloSPORINE, cytarabine, dacarbazine, DACTINomycin, DAPTOmycin, DAUNOrubicin, dexamethasone, dexmedetomidine, dexrazoxane, digoxin, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doxacurium, DOXOrubicin, DOXOrubicin liposomal, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, ertapenem, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, fluorouracil, foscarnet, fosphenytoin, furosemide, ganciclovir, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, haloperidol, heparin, hydrALAZINE, hydrocortisone sodium succinate, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, inamrinone, insulin (regular), irinotecan, isoproterenol, ketorolac, labetalol, leucovorin, levofloxacin, levorphanol, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, meropenem, mesna, metaraminol, methohexital, methotrexate, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, minocycline, mitoMYcin, mitoXANtrone, mivacurium, morphine, nafcillin, nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxaliplatin, palonosetron, pamidronate, pancuronium, pantoprazole, PEMEtrexed, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phenylephrine, piperacillin, piperacillin-tazobactam, polymyxin B, potassium chloride, potassium phosphates, procainamide, prochlorperazine, promethazine, propranolol, quiNIDine, raNITIdine, remifentanil, riTUXimab, rocuronium, sargramostim, sodium acetate, sodium bicarbonate, sodium phosphates, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, tacrolimus, teniposide, theophylline, thiopental, thiotepa, ticarcillin, ticarcillin-clavulanate, tirofiban, tobramycin, tolazoline, trastuzumab, trimethobenzamide, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, voriconazole, zidovudine

## ADVERSE EFFECTS

**CNS:** Pain at tumor site, headache, confusion, fever, chills, malaise
**CV:** MI, stroke
**GI:** *Nausea, vomiting, anorexia, stomatitis, weight loss,* ulceration of mouth, lips
**GU:** Hemolytic-uremic syndrome
**IDIOSYNCRATIC REACTION:** Hypotension, confusion, fever, chills, wheezing
**INTEG:** *Rash, hyperkeratosis, nail changes, alopecia,* pruritus, acne, striae, peeling, hyperpigmentation, phlebitis
**RESP:** Fibrosis, pneumonitis, wheezing, pulmonary toxicity
**SYST:** Anaphylaxis, radiation recall, Raynaud's phenomenon

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (IM, SUBCUT, intrapleural, intraperitoneal) |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver, 30% |
| **Excretion** | Kidneys, unchanged (50%) |
| **Half-life** | 2-4 hr; increased in renal disease |

### Pharmacodynamics

| | |
|---|---|
| IV, IM SUBCUT | Peak 30-60 min |

## INTERACTIONS

### Individual drugs

Filgrastim, sargramostim: increased toxicity
Fosphenytoin, phenytoin: decreased phenytoin levels, check drug level periodically
Radiation: increased toxicity, bone marrow suppression

### Drug classifications

Anesthetics (general), antineoplastics: increased toxicity, use together cautiously
Live virus vaccines: avoid concurrent use, adverse reactions may occur

### Drug/lab test

Increased: uric acid
Decrease: Pulmonary function tests

## NURSING CONSIDERATIONS

### Assessment

- Assess buccal cavity q8hr for dryness, sores or ulceration, white patches, oral pain, bleeding, dysphagia; obtain prescription for viscous lidocaine (Xylocaine)
- Assess symptoms indicating anaphylaxis: rash, pruritus, urticaria, purpuric skin lesions, itching, flushing, wheezing, hypotension; have emergency equipment available

**BLACK BOX WARNING: Pulmonary toxicity/fibrosis:** Risk increases >70 yr, assess pulmonary function tests; chest x-ray before, during therapy; monitor q2wk during treatment; pulmonary diffusion capacity for carbon monoxide ($DL_{CO}$) monthly; if <40% of pretreatment value, stop treatment; assess for dyspnea, crackles, unproductive cough, chest pain, tachypnea, fatigue, increased pulse, pallor, lethargy, more common in the elderly, radiation therapy, pulmonary disease; usually occurs with cumulative doses >400 units

• Monitor CBC, differential, platelet count weekly; withhold product for WBC <4000/mm$^3$ or platelet count <100,000/mm$^3$; notify prescriber of results for WBC <20,000/mm$^3$, platelets <150,000/mm$^3$

**BLACK BOX WARNING: Idiosyncratic reaction:** Severe reaction in those with lymphoma, assess hypotension, mental confusion, fever, chills, wheezing in lymphoma

**BLACK BOX WARNING:** Requires a specialized care setting and experienced clinician due to severe reactions

• Monitor temp (may indicate beginning of infection)
• Monitor liver function tests before, during therapy (bilirubin, AST, ALT, LDH) as needed or monthly
• Assess for bleeding: hematuria, stool guaiac, bruising or petechiae, mucosa or orifices q8hr; inflammation of mucosa, breaks in skin
• Treat pulmonary infection prior to treatment; identify dyspnea, crackles, unproductive cough, chest pain, tachypnea
• Identify effects of alopecia on body image; discuss feelings about body changes; if edema in feet, joint pain, stomach pain, shaking present, prescriber should be notified; identify inflammation of mucosa, breaks in skin
• **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

• Teach patient to avoid use of products containing aspirin or ibuprofen, razors, commercial mouthwash; bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools); decreased urination
• Instruct patient to report signs of anemia (fatigue, headache, irritability, faintness, shortness of breath)
• Instruct patient to report any changes in breathing or coughing even several months after treatment; to avoid crowds and persons with respiratory tract or other infections
• Inform patient that hair may be lost during treatment; a wig or hairpiece may make patient feel better; new hair may be different in color, texture
• Caution patient not to have any vaccinations without the advice of the prescriber; serious reactions can occur
• Advise patient contraception is needed during treatment and for several months after completion of therapy

### Evaluation

**Positive therapeutic outcome**

• Prevention of rapid division of malignant cells

**⚠ HIGH ALERT**

## bortezomib (Rx)

(bor-tez′oh-mib)
**Velcade**
*Func. class.:* Antineoplastic—miscellaneous
*Chem. class.:* Proteasome inhibitor

**ACTION:** Reversible inhibitor of chymotrypsin-like activity in mammalian cells; causes a delay in tumor growth by disrupting normal homeostatic mechanisms 26S proteasome

**Therapeutic outcome:** Decreased growth and spread of malignant cells

**USES:** Multiple myeloma previously untreated or when at least two other treatments have failed; mantle cell lymphoma

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity to this product, boron, or mannitol

**Precautions:** Peripheral neuropathy, children, geriatric, cardiac/hepatic disease, hypotension, tumor lysis syndrome, thrombocytopenia, infection, diabetes mellitus, bone marrow suppression, intracranial bleeding, injection-site irritation

## DOSAGE AND ROUTES

### Multiple myeloma (previously untreated)

**Adult: IV** bol/subcut Give for 9 6-wk cycles; cycle 1-4, 1.3 mg/m$^2$/dose given on days 1, 4, 8, 11, then a 10-day rest period (days 12-21) and again on days 22, 25, 29, 32, then a 10-day rest period (days 33-42) given with melphalan (9 mg/m$^2$/day on days 1-4) and predniSONE (60 mg/m$^2$/day on days 1-4); this 6-wk cycle is considered one course; in cycles 5-9, give bortezomib 1.3 mg/m$^2$/dose on days 1, 8, 22, 29 with melphalan (9 mg/m$^2$/day on days 1-4) and predniSONE (60 mg/m$^2$/day on days 1-4); this 6-wk cycle is considered one course; at least 72 hr should elapse between consecutive doses

### Mantle cell lymphoma in combination

**Adult: IV** bol/subcut 1.3 mg/m$^2$/dose (days 1, 4, 8, 11) followed by 10-day rest period (days 12 to 21); × 6 (3wk) cycles with riTUXimab 375 mg/m2, cyclophosphamide 750 mg/m2, DOXOrubicin 50mg/m2 all on day 1, and predniSONE 100mg/m2 q day on day 1-5, give bortezomib before riTUXimab

### Neuropathic pain
Grade 1 with pain or grade 2, reduce to 1 mg/m$^2$; grade 2 with pain or grade 3, hold product until toxicity resolves, then start at 0.7 mg/m$^2$ qwk; grade 4 hematologic toxicities, withhold use

### Relapsed multiple myeloma or mantle cell lymphoma
who have received ≥ 1 prior therapy
**Adult:** IV BOL/SUBCUT 1.3 mg/m2/dose on days 1, 4, 8, 11 followed by a 10-day rest period

### Hepatic dose
**Adult:** IV bilirubin >1.5 × ULN reduce to 0.7 mg/m$^2$ in cycle 1, consider dose escalation to 1 mg/m$^2$ or further reduction to 0.5 mg/m$^2$ in next cycles based on tolerability

**Available forms:** Lyophilized powder for inj 3.5 mg

### Implementation
**SUBCUT route**
- Reconstitute with 1.4 ml NS (2.5 mg/ml) or 3.5 ml NS (1 mg/ml); the 1 mg/ml may be used for local inj site reaction with the 2.5 mg/ml solution; if injection-site reaction occurs, use 1 mg/ml; the final product should be a clear, colorless solution; if any discoloration or particulate matter is observed, do not use
- Store reconstituted at room temperature, give within 8 hr of reconstitution, store ≤8 hr in a syringe; total storage time must be ≤8 hr when exposed to normal light
- Determine the volume of reconstituted bortezomib to be administered by multiplying the desired dose in mg/m$^2$ by the patient's BSA and dividing the result by the concentration (1 mg/ml or 2.5 mg/ml); discard unused drug, as no preservative is present
- Place a sticker that indicates subcut use on the syringe

**SUBCUT inj**
- Inject subcutaneously in the thigh or abdomen; do not inject into a site that is tender, bruised, erythematous, or indurated; rotate injection sites; new sites should be at least 1 inch from an old site
- Use of gloves and protective clothing are recommended to prevent skin contact

**IV direct**
- **Reconstitute** each vial with 3.5 ml 0.9% NaCl (1 mg/ml), sol should be clear/colorless; **inject** bol over 3-5 sec
- Store unopened product at room temperature, protect from light
- Use protective clothing during handling, preparation; avoid contact with skin
- Monitor for extravasation at inj site

## ADVERSE EFFECTS
**CNS:** Anxiety, insomnia, dizziness, headache, *peripheral neuropathy,* rigors, paresthesia, fever, headache
**CV:** Hypotension, edema, HF
**GI:** Abdominal pain, *constipation,* diarrhea, dyspepsia, *nausea, vomiting,* anorexia
**HEMA:** Anemia, neutropenia, thrombocytopenia
**MISC:** Dehydration, weight loss, herpes zoster, *rash,* pruritus, blurred vision
**MS:** *Fatigue, malaise, weakness,* arthralgia, bone pain, muscle cramps, myalgia, back pain, tumor lysis syndrome
**RESP:** Cough, pneumonia, dyspnea, URI, ARDs, pneumonitis, interstitial pneumonia, lung infiltration

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 83% |
| **Metabolism** | P450 enzymes (3A4, 2D6, 2C19, 2C9, 1A2) |
| **Excretion** | Unknown |
| **Half-life** | 9-15 hr |

### Pharmacodynamics
Unknown

## INTERACTIONS
### Individual drugs
Amiodarone, amprenavir, chloramphenicol, CISplatin, colchicine, cycloSPORINE, dapsone, didanosine, disulfiram, DOCEtaxel, gold salts, INH, iodoquinol, isoniazid, lamiVUDine, metroNIDAZOLE, nitrofurantoin, oxaliplatin, PACLitaxel, penicillAMINE, phenytoin, ritonavir, stavudine, sulfaSALAzine, thalidomide, vinBLAStine, vinCRIStine, zacatabine, zidovudine, and others: increased peripheral neuropathy

### Drug classifications
Anticoagulants, NSAIDs, platelet inhibitors, salicylates, thrombolytics: increased bleeding risk
Antihypertensives: increased hypotension, monitor B/P often
Antivirals, statins, HMG-CoA reductase inhibitors: increased peripheral neuropathy
Hematopoietic pregenitor cells (sargramostim, filgrastim): do not use within 24 hr of chemotherapy
Oral hypoglycemics: increased hypo/hyperglycemia
Products that induce or inhibit CYP3A4: increased toxicity or decreased efficacy
Decreased: effect of norethindrone, estradiol, combination oral contraceptives,

another nonhormonal contraceptive should be used
Fatal pulmonary toxicity: assess for risk factors, or new worsening pulmonary symptoms
Tumor lysis syndrome: usually with those with a high tumor burden

### Drug/herb
St. John's wort: toxicity or decreased efficacy

### Drug/lab tests
Increase: LFTs, glucose, platelets, Hb

## NURSING CONSIDERATIONS
### Assessment
- Assess hematologic status: platelets, CBC throughout treatment
- **Reversible posterior leukoencephalopathy syndrome (RPLS): Headache, confusion, lethargy, possible hypertension, usually occurs 16 hr to 1 yr after initial treatment, discontinue product**

### Patient/family education
- **Pregnancy/breastfeeding:** Teach to use contraception while on this product, do not breastfeed
- Advise diabetic to monitor blood glucose levels
- Instruct to contact prescriber if new or worsening peripheral neuropathy, severe vomiting, diarrhea, easy bruising, bleeding, infection
- Advise to avoid driving, operating machinery until effect is known
- Advise to avoid using other medications unless approved by prescriber
- Bleeding risk (report bruising, bleeding)
- Provide fluids and electrolytes as needed
- Teach patient to report immediately, headache, confusion, lethargy (RPLS)
- **Pregnancy/breastfeeding:** do not use in pregnancy, breastfeeding

### Evaluation
**Positive therapeutic outcome**
- Improvement of multiple myeloma symptoms

## bosentan (Rx) REMS
(boh-sen-tan)
**Tracleer**
*Func. class.:* Vasodilator
*Chem. class.:* Endothelin receptor antagonist

**Do not confuse:** Tracleer/Tricor

**ACTION:** Peripheral vasodilation occurs via antagonism of the effect of endothelin on endothelium and vascular smooth muscle

**Therapeutic outcome:** Decreased pulmonary arterial hypertension

**USES:** Pulmonary arterial hypertension with WHO class III, IV symptoms

**Unlabeled uses:** Septic shock to improve microcirculatory blood flow

## CONTRAINDICATIONS
Hypersensitivity, CVA, CAD

**Precautions:** Breastfeeding, children, geriatric, mitral stenosis, impaired hepatic function, anemia, edema, jaundice, hypovolemia, hypotension

**BLACK BOX WARNING:** Pregnancy, hepatic disease, requires an experienced clinician, contraceptive requirements, pregnancy testing

## DOSAGE AND ROUTES
**Adult ≥10-20 and child >12 yr:** PO 31.25 mg qday, titrate up to 31.25 mg BID after 4 wk
**Adult <20-40 and child >12 yr:** PO 31.25 mg bid, titrate to 62.5 mg bid after 4 wk (unlabeled)

### Adults taking a protease inhibitor for ≥10 days
**Adult:** PO 62.5 mg qday or every other day based on tolerance, max 125 mg/day

### Hepatic dose
**Adult:** PO
- **Baseline AST/ALT <3× ULN:** no dosage change, monitor LFTs qmo, reduce or interrupt if elevated
- **AST/ALT >3 and ≤5× ULN:** repeat test; if confirmed, reduce to 62.5 mg bid or interrupt; monitor LFTs q2wk, if interrupted, restart when LFTs <3× ULN, check LFTs within 3 days
- **Increase in AST/ALT >5 and ≤5× ULN:** during treatment, repeat test to confirm, discontinue, monitor LFTs q2wk until LFTs <3× ULN, restart at starting dose
- **AST/ALT >8× ULN:** discontinue permanently

**Available forms:** Tabs 62.5, 125 mg

### Implementation
- Store at room temperature
- Only available through the TAP program 866-228-3546

## ADVERSE EFFECTS
**CNS:** Headache, flushing, fatigue, fever
**CV:** *Hypotension, chest pain,* palpitations, edema of lower limbs, fluid retention
**GI:** Abnormal liver function, dyspepsia, hepatotoxicity, diarrhea

**HEMA:** Anemia, leukopenia, neutropenia, lymphopenia, thrombocytopenia
**INTEG:** Pruritus, Stevens-Johnson syndrome, toxic epidermal necrolysis, rash
**MISC:** Anaphylaxis, oligospermia, tumor lysis syndrome, respiratory infection, arthralgia
**SYST:** Secondary malignancy

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 50% absorbed |
| **Distribution** | Protein binding >98% |
| **Metabolism** | Liver (metabolites); metabolized CYP2C9, CYP3A4, and possibly CYP2C19; steady state 3-5 days |
| **Excretion** | Biliary |
| **Half-life** | 5 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

CycloSPORINE, glyBURIDE: do not coadminister
CycloSPORINE, ketoconazole: increased bosentan level
CycloSPORINE: decreased cycloSPORINE level
GlyBURIDE: glyBURIDE level decreased significantly, bosentan also decreased, increased liver function tests
Ketoconazole: increased bosentan level
Simvastatin: decreased effects
Warfarin: decreased anticoagulation

### Drug classifications

Contraceptives (hormonal), statins: decreased effects
CYP2C9, CYP3A4 inhibitors: increased bosentan effects

### Drug/lab test

**BLACK BOX WARNING:** Increased: ALT, AST

Decreased: Hgb, Hct

## NURSING CONSIDERATIONS

### Assessment

- **Serious skin toxicities:** angioedema occurring 8-21 days after initiating therapy
- Assess B/P, pulse during treatment until stable
- **Assess hepatic toxicity:** AST, ALT, bilirubin; liver enzymes may increase; if ALT/AST >3 and ≤5 × ULN, decrease dose or interrupt treatment and monitor AST/ALT q2wk; if >2 × ULN, and bilirubin >2 × ULN or signs of hepatitis, hepatic disease, stop treatment; vomiting, jaundice; product should be discontinued
- Assess blood studies: Hct, Hgb after 1 mo, 3 mo, then q3mo may be decreased
- **Pulmonary hypertension/HF:** fluid retention, weight gain, increased leg edema; may occur within wks
- **Beers:** Use with caution in older adults, syncope may be exacerbated

**BLACK BOX WARNING:** Experienced clinician: Must be enrolled in the Tracleer REMS program and comply with requirements

**BLACK BOX WARNING:** Pregnancy: perform pregnancy testing before and during treatment in all female patients of childbearing potential, do not use unless a negative serum or urine pregnancy test is confirmed during the first 5 days after a normal menstrual period and at least 11 days after the last unprotected sex, then monthly, do not use hormonal contraceptive as sole method

### Patient/family education

- Instruct patient to report jaundice, dark urine, joint pain, fatigue, malaise, bruising, easy bleeding, fluid retention

**BLACK BOX WARNING:** Pregnancy, monitor pregnancy test monthly; patient must use nonhormonal contraception during and ≥ 1 month after conclusion of treatment

- Instruct patient to take without regard to food, do not take new meds/herbs without prescriber approval, to take in AM or PM

### Evaluation

**Positive therapeutic outcome**

- Decrease in pulmonary hypertension

**⚠ HIGH ALERT**
**RARELY USED**

## bosutinib (Rx)

(boe-sue'ti-nib)
**Bosulif**
*Func. class.:* Antineoplastic biologic response modifiers
*Chem. class.:* Signal transduction inhibitors (STIs), tyrosine kinase inhibitor

**USES:** Treatment of CML; (chronic accelerator phase) Philadelphia-chromosome–positive patients in blast-cell crisis

## CONTRAINDICATIONS
Pregnancy, hypersensitivity

**Precautions:** Breastfeeding, children, diarrhea, geriatric patients, hepatic disease, bone marrow suppression, infection, thrombocytopenia, neutropenia, immunosuppression, fluid retention

## DOSAGE AND ROUTES
**Adult: PO** 500 mg daily with food, may increase to 600 mg/day in those who have not developed grade 3 toxicity or in patients who do not reach complete hematological response by wk 8 or complete cytogenic response (CCyR) by wk 12

### Hepatic dosage
**Adult:** PO Any baseline hepatic impairment: Start at 200 mg/day; liver transaminase $>5 \times$ ULN hold dose until levels $\leq 2.5 \times$ ULN, then resume at 400 mg/day; liver transaminase level $\geq 3 \times$ ULN and bilirubin $>2 \times$ ULN and alk phos $<2 \times$ ULN, discontinue

### Dosage adjustments for treatment related toxicity
**Hematologic toxicity:** ANC $<1000 \times 10^6$/L or platelet count $<50{,}000 \times 10^6$/L: hold dose until ANC $\geq 1000 \times 10^6$/L and platelets $\geq 50{,}000 \times 10^6$/L; if recovery within 2 wks, resume therapy at the same dose; if blood counts remain low after 2 wks, upon recovery, resume at 100 mg/day less than the previous dose

**Diarrhea:** Grade 3 or 4 diarrhea (≥7 stools/day compared with baseline): hold therapy until recovery to grade 1 toxicity or lower; resume therapy at 400 mg/day

**Other nonhematologic toxicity:** Significant or moderate or severe toxicity: hold therapy until toxicity resolves; resume therapy at 400 mg/day

**⚠ HIGH ALERT**

## brentuximab (Rx)
(bren-tak′see-mab)
**Adcetris**
*Func. class.:* antineoplastic
*Chem. class.:* monoclonal antibody

**ACTION:** The anticancer activity is due to the binding of the ADC to CD30-expressing cells, followed by the internalization and transportation of the ADC-CD30 complex to lysosomes, and the release of MMAE via selective proteolytic cleavage. MMAE binds to tubulin and disrupts the microtubule network within the cell, inducing cell cycle arrest and apoptotic death of the cells

**Therapeutic outcome:** Decreasing symptoms of Hodgkin's disease (increased lymph nodes, night sweats, weight loss, splenomegaly, hepatomegaly)

**USES:** For the treatment of Hodgkin's disease after failure of autologous stem cell transplant (ASCT) or after failure of at least 2 prior multiagent chemotherapy regimens in patients who are not ASCT candidates; For the treatment of non-Hodgkin's lymphoma (NHL): For the treatment of systemic anaplastic large cell lymphoma (sALCL) after failure of at least one prior multiagent chemotherapy regimen

## CONTRAINDICATIONS
Hypersensitivity, pregnancy

**BLACK BOX WARNING:** Progressive multifocal leukoencephalopathy (PML)

**Precautions:** Breastfeeding, children, infants, neonates, neutropenia, peripheral neuropathy, tumor lysis syndrome (TLS)

## DOSAGE AND ROUTES
**Adult:** IV 1.8 mg/kg IV over 30 minutes every 3 weeks until disease progression or unacceptable toxicity. For patients >100 kg, max weight used for dosage calculation should be 100 kg, which translates to no more than 180 mg/dose

### Dose adjustments for toxicity due to peripheral neuropathy:
**For Grade <3:** No dosage adjustments are recommended; For new or worsening grade 2/3: Interrupt treatment until toxicity resolves to grade ≤1; when resuming treatment, reduce dosage to 1.2 mg/kg IV q3wk; For Grade 4: Discontinue treatment

### Dose adjustments for toxicity due to neutropenia:
**For neutropenia Grade <3:** No dosage adjustments; For Grade 3/4 neutropenia: Interrupt treatment until toxicity resolves to baseline or grade ≤2; consider the use of growth factors (CSFs) for subsequent cycles of therapy; For Grade 4 neutropenia despite the use of growth factors: Discontinue treatment or reduce the dose to 1.2 mg/kg IV q3wk

**Available forms:** Powder for injection 50 mg

**Implementation:**

**Intermittent IV infusion route**
- Visually inspect for particulate matter and discoloration whenever solution and container permit
- Give only as an IV infusion, do not give as an IV push or bolus

- Use cytoxic handling procedures
- Do not mix with, or administer as an infusion with, other IV products
- Calculate the dose (mg) and the number of vials required. For patients weighing >100 kg, use 100 kg to calculate the dose; reconstitute each 50 mg vial/10.5 ml of sterile water for injection (5 mg/ml)
- Direct the stream of sterile water toward the wall of the vial and not directly at the cake or powder; gently swirl the vial to aid in dissolution, do not shake
- Discard any unused portion left in the vial
- After reconstitution, dilute immediately with ≥100 ml of 0.9% sodium chloride, 5% dextrose, or lactated ringers solution to a final concentration (0.4 mg/ml-1.8 mg/ml)
- Use the diluted solution immediately or store in refrigerator for ≤24 hrs after reconstitution; do not freeze
- Infuse over 30 min

## ADVERSE EFFECTS

**CNS:** Headache, dizziness, *fever,* peripheral neuropathy, anxiety, chills, confusion, *fatigue,* paresthesias, insomnia, night sweats, progressive multifocal leukoencephalopathy (PML)
**CV:** Peripheral edema, supraventricular arrhythmia
**GI:** *Abdominal pain, nausea, vomiting,* constipation, *diarrhea,* weight loss
**HEMA:** Anemia, neutropenia, thrombocytopenia, lymphadenopathy
**INTEG:** *Rash,* pruritus, alopecia, xerosis
**RESP:** Pneumothorax, pneumonitis, pulmonary embolism, dyspnea, *cough*
**SYST:** Anaphylaxis, tumor lysis syndrome, antibody formation, Stevens-Johnson syndrome, infusion reactions

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding, 68%-82% |
| **Metabolism** | Small amount, potent inhibitors or inducers of CYP3A4, may alter action |
| **Excretion** | Unknown |
| **Half-life** | Terminal 4-6 days; three components are released |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Boceprevir, dalfopristin; delavirdine, isoniazid, indinavir, itraconazole, ketoconazole, quinupristin, rifAMPin, ritonavir; telithromycin, tipranavir: increased brentuximab component action:
**Bleomycin:** increased noninfectious pulmonary toxicity; do not use together

### Drug/herb

St. John's wort: increased brentuximab CYP3A4 inducers P-gb inhibitors action
Decrease: brentuximab action-CYP3A4 inducers

## NURSING CONSIDERATIONS

### Assessment

- **Tumor lysis syndrome (TLS):** Assess for hyperkalemia, hyperphosphatemia, hypocalcemia; may develop renal failure may use allopurinol or rasburicase to prevent TLS; monitor serum BUN/Creatinine
- **Pregnancy:** determine if pregnancy is planned or suspected, do not use in pregnancy/breastfeeding
- **Progressive multifocal leukoencephalopathy (PML):** Assess for weakness, or paralysis, vision loss, impaired speech, and cognitive deterioration; often fatal
- Monitor CBC and differential, LFTs, serum bilirubin (direct and indirect), electrolytes, uric acid, neurologic function

### Patient/family education

- Teach patient to report immediately weakness, change in vision, impaired speech; peripheral neuropathy, neutropenia if severe
- Advise patient to use reliable contraception, do not use in breastfeeding
- Use the diluted sol immediately or store in refrigerator for ≤24 hr after reconstitution; do not freeze

### Evaluation

**Positive therapeutic outcome**

- Decreasing symptoms of Hodgkin's disease (increased lymph nodes, night sweats, weight loss, splenomegaly, hepatomegaly)

**brimonidine ophthalmic**
*See Appendix B*

**brinzolamide ophthalmic**
*See Appendix B*

**bromfenac ophthalmic**
*See Appendix B*

**⚠ HIGH ALERT**

# bromocriptine (Rx)

(broe-moe-krip'teen)

**Cycloset, Parlodel**

*Func. class.:* Antiparkinsonian agent; DOPamine receptor agonist

**Do not confuse:** bromocriptine/benztropine/brimonidine, Parlodel/pindolol/Provera

**ACTION:** Inhibits prolactin release by activating postsynaptic DOPamine receptors; activation of striatal DOPamine receptors may be reason for improvement in Parkinson's disease

**Therapeutic outcome:** Decreased involuntary movements in Parkinson's disease; decreased breastfeeding; decreased hormone levels in acromegaly; absence of amenorrhea in hyperprolactinemia

**USES:** Parkinson's disease, amenorrhea/galactorrhea caused by hyperprolactinemia, infertility, acromegaly, pituitary adenomas, adjunct in type 2 diabetes

**Unlabeled uses:** Neuroleptic malignant syndrome, alcoholism, premenstrual syndrome, mastalgia, cocaine withdrawal

## CONTRAINDICATIONS

Hypersensitivity to ergot, bromocriptine/eclampsia; uncontrolled hypertension, preeclampsia, basilar/hemiplegic migraine, breastfeeding, migraine

**Precautions:** Pregnancy, breastfeeding, children, hepatic/renal disease, pituitary tumors, peptic ulcer disease, sulfite hypersensitivity, pulmonary fibrosis, dementia, GI bleeding, bipolar disorder, abrupt discontinuation, acute MI, angina, type 1 diabetes mellitus

## DOSAGE AND ROUTES

### Parkinson's disease (not Cycloset)

**Adult:** PO 1.25 mg bid with meals; may increase q2-4wk by 2.5 mg/day; not to exceed 100 mg/day, levodopa should be continued while bromocriptine is being instituted

### Hyperprolactinemia (not Cycloset)

**Adult:** PO 1.25-2.5 mg with meals; may increase by 2.5 mg q3-7days; usual dosage 2.5-15 mg/day

### Acromegaly (not Cycloset)

**Adult:** PO 1.25-2.5 mg/day × 3 days at bedtime; may increase by 1.25-2.5 mg q3-7days; usual range 20-30 mg/day; max 100 mg/day

### Type 2 diabetes (Cycloset only)

**Adult:** PO (initially) 0.8 mg qd in AM within 2hr of waking, titrate by 0.8 mg/day no more than qwk to max 1.6-4.8 mg/day

### Pituitary adenoma (not Cycloset)

**Adult/adolescent ≥ 16 yr:** PO 1.25 mg bid-tid, may increase over several weeks to 10-20 mg/day

### Traumatic brain injury (unlabeled)

**Adult:** PO 2.5 mg daily, continue if response occurs

**Available forms:** Caps 5 mg; tabs 2.5 mg; (Perodel), 0.8mg (cycloset)

### Implementation

- Give with meals or milk to prevent GI symptoms; cyclosert: give with food in AM within 2 hr of waking crush tab if patient has swallowing difficulty
- Give at bedtime so dizziness, orthostatic hypotension do not occur
- Store at room temperature in airtight container

## ADVERSE EFFECTS

**CNS:** *Headache,* depression, restlessness, anxiety, nervousness, confusion, seizures, hallucinations, *dizziness,* fatigue, drowsiness, abnormal involuntary movements, psychosis, weakness

**CV:** *Orthostatic hypotension,* decreased B/P, palpitations, extrasystole, shock, dysrhythmias, bradycardia, MI

**EENT:** Blurred vision, diplopia, burning eyes, nasal congestion

**GI:** *Nausea, vomiting, anorexia,* cramps, constipation, diarrhea, dry mouth, GI hemorrhage

**GU:** Frequency, retention, incontinence, diuresis

**INTEG:** *Rash on face, arms,* alopecia, coolness, pallor of fingers, toes, peripheral edema

**META:** Hypoglycemia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Poorly absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Liver, completely |
| **Excretion** | 85%-98% feces |
| **Half-life** | 4 hr (initial); 50 hr (terminal) |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ½-1½ hr |
| **Peak** | 1-3 hr |
| **Duration** | 8-12 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased disulfiramlike reaction
Chloramphenicol, levodopa, probenecid: increased neurologic effects
Haloperidol, loxapine, methyldopa, metoclopramide, reserpine: decreased levels of bromocriptine
Levodopa: increased neurologic effects
Metoclopramide: decreased effect of bromocriptine, avoid concurrent use

### Drug classifications

Antihypertensives: increased hypotension, doses of both products may need to be adjusted
Butyrophenones, CYP3A4 inhibitors, phenothiazines, thioxanthenes: decreased bromocriptine effect
Contraceptives (oral), estrogens, MAOIs, phenothiazines, progestins: decreased levels of bromocriptine, dose may need to be decreased
CYP3A4 inducers: increased bromocriptine effect, use cautiously
Salicylates, sulfonamides: increased neurologic effects, doses of both products may need to be adjusted

### Drug/lab test

Increased: growth hormone, AST, ALT, BUN, CK, uric acid, alkaline phosphatase

## NURSING CONSIDERATIONS

### Assessment

- Assess symptoms of **Parkinson's disease** (EPS): shuffling gait, muscle rigidity, involuntary movements, pill rolling, muscle spasms, drooling before, during treatment
- Assess for resolution of symptoms of neuroleptic malignant syndrome: decreased temp, seizures, sweating, pulse
- Monitor for change in size of soft-tissue volume in acromegaly
- CNS symptoms: assess for CNS depression, hallucinations, vertigo, report symptoms immediately
- **Pregnancy:** may cause postpartum conception, use pregnancy testing q4wk or if menstruation does not occur
- Monitor B/P; establish baseline, compare with other readings; this product decreases B/P and causes orthostatic hypotension; patient should remain recumbent for 2-4 hr after first dose; supervise ambulation, obtain chest x-ray baseline

### Patient/family education

- Advise patient to change position slowly to prevent orthostatic hypotension
- Tabs may be crushed and mixed with food; bromocriptine to be taken within 2 hr of rising, that 8 wk are needed for full effect
- Caution patient to use contraceptives during treatment with this product; pregnancy may occur; to use methods other than oral contraceptives/subdermal implants
- Teach patient that therapeutic effect for Parkinson's disease may take 2 mo, titrate slowly: galactorrhea, amenorrhea
- Caution patient to avoid hazardous activity if dizziness, drowsiness occurs during treatment start-up
- Advise patient to avoid alcohol and OTC medication unless approved by prescriber
- Teach patients with acromegaly to notify prescriber immediately if severe headache, nausea, vomiting, blurred vision occur; indicates change in or enlargement of tumor
- Advise patient to report symptoms of MI immediately
- Teach patient to take with food, avoid alcohol

### Evaluation

**Positive therapeutic outcome**

- Parkinson's disease: decreased slow movements, decreased drooling
- Decreased breast engorgement with accompanied pain, tenderness
- Acromegaly: decreased growth hormone levels

## budesonide (Rx)

(byoo-des'oh-nide)
**Eceris, Entocort EC, Pulmicort, Pulmicort Flexhaler, Pulmicort Respules, Pulmicort Turbohaler, Rhinocort Aqua, Uceris**
*Func. class.:* Glucocorticoid

**ACTION:** Prevents inflammation by depression of migration of polymorphonuclear leukocytes, fibroblasts, reversal of increased capillary permeability and lysosomal stabilization; does not suppress hypothalamus and pituitary function

**USES:** Rhinitis; prophylaxis for asthma; Crohn's disease, ulcerative colitis

## CONTRAINDICATIONS

Hypersensitivity, status asthmaticus, acute bronchospasm

**Precautions:** Pregnancy; breastfeeding, children, TB, fungal, bacterial, systemic viral infections, ocular herpes simplex, nasal septal ulcers; hepatic disease, diabetes, GI disease, increased intraoccular pressure

## DOSAGE AND ROUTES

### Rhinitis

**Adult and child >6 yr:** Spray/inh 2 sprays in each nostril AM, PM, or 4 sprays in each nostril AM

### Asthma

**Adult and child >6 yr:** INH 400-1200 mcg/day
**Child 1-8 yrs previously taking bronchodilator alone:** (Respules) 0.5 mg q day or 0.25 mg bid susp via jet nebulizer, max 0.5 mg q day; previously using inhaled corticosteroid 0.5 mg q day or 0.25 mg bid susp via jet nebulizer, max 0.5 mg bid

### Crohn's disease, ulcerative colitis (Uceris)

**Adult:** PO 9 mg daily AM × 8 wk

### Laryngotracheobronchitis (croup) (unlabeled)

**Infant ≥3 months-child ≤5 yr:** (Pulmicort Respules INH susp) 2 mg inhaled as a single dose

**Available forms:** Dry powder for INH 90, 100 ✦ 180, 200 ✦, 400 ✦ 32 mcg/actuation (Rhinocort Aqua) nasal spray; susp for inh 0.5 mg/2 ml, 0.25 mg/2 ml; ext rel tab (Uceris) 9 mg; cap 3 mg, rectal foam 2 mg/actuation

### Implementation

**PO route (Crohn's disease)**

- Swallow caps whole; do not break, crush, or chew, take in AM
- May repeat 8-wk course if needed; may taper to 6 mg/day for 2 wk before cessation

**Oral inh route (dry powder for inh) (Pulmicort Turbuhaler)**

- A new Turbuhaler should be primed before use, per the priming instructions that come with the device; while priming the Turbuhaler and loading the dose, hold in upright position; to load the dose on a primed inhaler, twist the brown grip fully to the right as far as it will go, then twist it back fully to the left; there will be the sound of a "click"
- When inhaling, the Turbuhaler may be held upright or horizontally; turn head away from the inhaler and breathe out; place the mouthpiece between the lips and inhale deeply and forcefully; remove the inhaler from the mouth and exhale normally; do not blow or exhale into the mouthpiece; do not chew or bite on the mouthpiece; if more than one dose is required, repeat the steps
- After the last dose, rinse the mouth with water; do not swallow the water; keep inhaler clean and dry

**Inh susp route for nebulization (Pulmicort Respules)**

- Use via jet nebulizer connected to an air compressor with adequate airflow and equipped with a mouthpiece or suitable face mask; do not use ultrasonic nebulizers
- See manufacturer's direction on use of nebulizer and preparation of the solution
- Gently shake the ampule in a circular motion before opening it and placing the suspension in the nebulizer reservoir; using the "blow by" technique (i.e., holding the face mask or open tube near the patient's nose and mouth) is not recommended; use inh susp separately in the nebulizer
- Store inhal susp upright at controlled room temperature and protected from light; after opening the envelope, the shelf life of the unused respules is 2 wk; return unused respules to the aluminum foil envelope to protect from light; opened respule should be used promptly

**Intranasal inhalation route**

- Instruct patient on proper nasal inhalation priming and use; shake inhaler well; prior to initial use, the Rhinocort Aqua container must be shaken gently and the pump must be primed by actuating 8 times; if used daily, the pump does not need to be reprimed; if not used for 2 consecutive days, reprime with 1 spray or until a fine spray appears; if not used for more than 14 days, rinse the applicator and reprime with 2 sprays or until a fine spray appears; blow nose gently, without squeezing; with head upright, spray into each nostril; sniff while squeezing the bottle quickly and firmly; after use, rinse the tip of the bottle with hot water, taking care not to suck water into the bottle, and dry with a clean tissue; replace the cap
- To avoid the spread of infection, do not use the container for more than one person
- Store at 59°-86° F (15°-30° C); keep away from heat, open flame

**Rectal Foam Route**

- Product is flammable, may use prior to bedtime, applicators are single use only

## ADVERSE EFFECTS

**CNS:** *Headache,* insomnia, hypertonia, syncope, dizziness, drowsiness
**CV:** Chest pain, hypertension, sinus tachycardia, palpitation
**EENT:** *Sinusitis, pharyngitis,* rhinitis, oral candidiasis
**ENDO:** Adrenal insufficiency, growth suppression in children
**GI:** Dry mouth, dyspepsia, nausea, vomiting, abdominal pain
**MISC:** Ecchymosis, fever, *hypersensitivity,* flu-like symptoms, epistaxis, dysuria
**MS:** Back pain, myalgias, fractures
**RESP:** Nasal irritation, cough, nasal bleeding, *respiratory infections,* bronchospasm

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 39% |
| **Distribution** | In airways, protein binding 85%-90% |
| **Metabolism** | Liver |
| **Excretion** | In urine (60%), small amounts in feces, enters breast milk |
| **Half-life** | 2-3.6 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Respules 2-8 days, Rhinocort Aqua 10 hr |
| **Peak** | Respules 4-6 wk, Rhinocort Aqua 2 wk |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Varicella live vaccine: avoid concurrent use in pediatric patients

### Drug classifications

CYP3A inhibitors: increased budesonide effect; dose adjustment may be required

## NURSING CONSIDERATIONS

### Assessment

- **Crohn's disease/ulcerative colitis: Assess for improvement: decreased stools, abdominal cramps, urgency**
- **Adrenal suppression: may occur if stopped abruptly, taper**
- Assess respiratory status: rate, rhythm, increase in bronchial secretions, wheezing, chest tightness; provide fluids to 2 L/day to decrease thickness of secretions; check for oral candidiasis
- For bronchospasm, stop treatment and give bronchodilator
- With viral infections, corticosteroid use can mask infections
- For increased intraocular pressure, discontinue use if increase occurs
- **Pregnancy/breastfeeding:** Fetal harm appears remote, excreted in breast milk, consider risk factors
- **Beers:** Avoid in older adults, high risk of delirium

### Patient/family education

- Teach patient to notify prescriber of pharyngitis, nasal bleeding, oral candidiasis
- Instruct patient not to exceed recommended dosage; adrenal suppression may occur
- Teach patient to carry/wear emergency ID identifying steroid use
- Instruct patient to read and follow package directions
- Instruct patient to prevent exposure to infections, especially viral
- Advise to use good oral hygiene if using by nebulizer or inhaler
- Teach patient to avoid breastfeeding
- Teach patient that product is not a bronchodilator and is not to be used for asthma; to use regularly
- Teach how to use as described in "administer"
- Advise to notify prescriber if symptoms persist after 3 wk, that results usually take 2 wk
- Advise to notify prescriber if exposure to measles, chickenpox occurs

### Evaluation

**Positive therapeutic outcome**

- Absence of asthma, rhinitis

## budesonide nasal agent

*See Appendix B*

## bumetanide (Rx)

(byoo-met'a-nide)

**Bumex, Burinex**

*Func. class.:* Loop diuretic, antihypertensive

*Chem. class.:* Sulfonamide derivative

**ACTION:** Acts on the ascending loop of Henle in the kidney to inhibit the reabsorption of the electrolytes sodium and chloride

**Therapeutic outcome:** Decreased edema in lung tissue and peripherally; decreased B/P

**USES:** Edema in congestive heart failure, ascites, heart failure

## CONTRAINDICATIONS

Hypersensitivity to sulfonamides, anuria, hepatic coma

**BLACK BOX WARNING:** Fluid and electrolyte depletion

**Precautions:** Pregnancy, breastfeeding, neonates, severe renal disease, ascites, hepatic cirrhosis, blood dyscrasias, ototoxicity, hyperuricemia, hypokalemia, hyperglycemia, oliguria, hypomagnesemia, hypovolemia

**BLACK BOX WARNING:** Dehydration

## DOSAGE AND ROUTES

**Adult/adolescent:** PO 0.5-2 mg daily may give 2nd or 3rd dose at 4-5 hr intervals; max 10 mg/day; may be given on alternate days or intermittently; **IM/IV** 0.5-1 mg; may give 2nd or 3rd dose at 2-3 hr intervals; max 10 mg/day

**Child (unlabeled):** PO/IM/**IV** 0.015-0.1 mg/kg/day or every other day, max 10 mg/day

**Available forms:** Tabs 0.5, 1, 2, 5 mg 🍁; inj 0.25 mg/ml

### Implementation

- Give in AM to avoid interference with sleep
- Potassium replacement if potassium level is <3.0 mg/dl whole, or use oral solutions; product may be crushed if patient is unable to swallow

**PO route**

- Use in AM to prevent nocturia
- The safest dosage schedule is on alternate days, without regard to food

**IV route**

- Do not use solution that is yellow or has a precipitate or crystals

**IV, direct route**

- Give undiluted through Y-tube or 3-way stopcock; give 20 mg or less/min

**Intermittent IV infusion route**

- May be added to 0.9% NaCl, $D_5W$, $D_{10}W$, $D_{20}W$, invert sugar 10% in electrolyte #1, LR, sodium lactate 1/6 mol/L; use within 24 hr to ensure compatibility; give through Y-tube or 3-way stopcock; give at 4 mg/min or less; use infusion pump

**Y-site compatibilities:** Acyclovir, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amiodarone, amoxicillin, amphotericin B lipid complex (Abelcet), amphotericin B liposome (AmBisome), anidulafungin, ascorbic acid injection, atenolol, atracurium, atropine, aztreonam, benztropine, bivalirudin, bleomycin, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, cefamandole, ceFAZolin, cefepime, cefmetazole, cefonicid, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, ceftobiprole, cefTRIAXone, cefuroxime, cephapirin, chloramphenicol, cimetidine, cisatracurium, CISplatin, cladribine, clarithromycin, clindamycin, codeine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, digoxin, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doripenem, doxacurium, DOXOrubicin, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, epoetin alfa, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, famotidine, fentaNYL, filgrastim, fluconazole, fludarabine, fluorouracil, folic acid, furosemide, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone sodium succinate, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, indomethacin, insulin (regular), irinotecan, isoproterenol, ketorolac, labetalol, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, metaraminol, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, mezlocillin, micafungin, miconazole, milrinone, mitoXANtrone, morphine, moxalactam, multiple vitamins injection, mycophenolate, nafcillin, nalbuphine, naloxone, netilmicin, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, palonosetron, pamidronate, pancuronium, pantoprazole, PEMEtrexed, penicillin G potassium/sodium, pentazocine, PENTobarbital, PHENobarbital, phenylephrine, phytonadione, piperacillin, piperacillin-tazobactam, polymyxin B, potassium chloride, procainamide, promethazine, propofol, propranolol, protamine, pyridoxine, quiNIDine, raNITIdine, remifentanil, rifAMPin, ritodrine, riTUXimab, rocuronium, sodium acetate, sodium bicarbonate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA, tobramycin, tolazoline, TPN, traMADol, trastuzumab, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, voriconazole

## ADVERSE EFFECTS

**CNS:** Headache, fatigue, weakness, vertigo
**CV:** *Hypotension,* chest pain, ECG changes, circulatory collapse, dehydration
**EENT:** Loss of hearing
**ELECT:** *Hypokalemia, hypochloremic alkalosis, hypomagnesemia, hyperuricemia, hypocalcemia, hyponatremia*
**ENDO:** *Hyperglycemia*
**GI:** Dry mouth, vomiting, anorexia, cramps, upset stomach, abdominal pain
**GU:** *Polyuria*
**HEMA:** Thrombocytopenia, leukopenia, granulocytopenia, hemoconcentration
**INTEG:** *Rash, pruritus*

### Pharmacokinetics

| | PO/IM |
|---|---|
| **Absorption** | Rapidly, completely absorbed |
| | **PO/IM/IV** |
| **Distribution** | Crosses placenta, protein binding >91% |
| **Metabolism** | Liver (30%-40%) |
| **Excretion** | Breast milk, urine (50% unchanged), feces (20%) |
| **Half-life** | 1-1½ hr |

### Pharmacodynamics

| | PO | IM | IV |
|---|---|---|---|
| **Onset** | ½-1 hr | 40 min | 5 min |
| **Peak** | 1-2 hr | 1-2 hr | ½ hr |
| **Duration** | 3-6 hr | 4-6 hr | 3-6 hr |

## INTERACTIONS

### Individual drugs

Digoxin: increased toxicity
Indomethacin: decreased diuretic and antihypertensive effects of bumetanide
Lithium: decreased renal clearance causing increased toxicity
MetOLazone: increased diuresis, electrolyte loss
Probenecid: decreased diuretic effect, other diuretics

### Drug classifications

Aminoglycosides: increased ototoxicity, CISplatin, avoid concurrent use
Antidiabetics: decreased antidiabetic effects
NSAIDs: decreased diuretic effect
Potassium-wasting products: increased hypokalemia, monitor closely

### Drug/herb

Hawthorn, horse chestnut: increased diuretic effect

### Drug/Lab

Increase: Glucose
Decrease: Chloride, potassium, sodium, calcium, phosphorus

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for tinnitus, hearing loss, ear pain; periodic testing of hearing is needed when high doses of this product are given by **IV** route

**BLACK BOX WARNING:** Dehydration: watch for dehydration

- Assess fluid volume status: I&O ratio and record, distended red veins, crackles in lung, color, quality and specific gravity of urine, skin turgor, adequacy of pulses, moist mucous membranes, bilateral lung sounds, peripheral pitting edema; dehydration symptoms of decreasing output, thirst, hypotension, dry mouth and mucous membranes should be reported; if urinary output decreases or azotemia occurs, product should be discontinued

**BLACK BOX WARNING:** Monitor for fluid and electrolyte depletion: potassium, sodium, calcium, magnesium; also include BUN, blood pH, ABGs, uric acid, CBC, blood glucose; severe electrolyte imbalances should be corrected before starting treatment

- Assess B/P before and during therapy with patient lying, standing, and sitting as appropriate; orthostatic hypotension can occur rapidly
- Monitor for digoxin toxicity (anorexia, nausea, vomiting, confusion, paresthesia, muscle cramps) in patients taking digoxin; lithium toxicity in those taking lithium
- **Beers:** Use cautiously in older adults, may cause or exacerbate syndrome of inappropriate antidiuretic hormone secretion
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, avoid use in breastfeeding

### Patient/family education

- Teach patient to take the medication early in the day to prevent nocturia, if another dose is needed, take after noon
- Instruct the patient to take with food or milk if GI symptoms of nausea and anorexia occur
- Teach patient to maintain weekly record of weight and notify prescriber of weight loss of >5 lb
- Caution the patient that this product causes a loss of potassium, so food rich in potassium should be added to the diet; refer to a dietitian for assistance in planning
- Caution the patient not to exercise in hot weather or stand for prolonged periods since orthostatic hypotension will be enhanced
- Teach patient not to use alcohol or any OTC medications without prescriber's approval; serious product reactions may occur
- Emphasize the need to contact prescriber immediately if muscle cramps, weakness, nausea, dizziness, or numbness occur
- Teach patient to take own B/P and pulse and record
- Teach patient to avoid rising rapidly to minimize orthostatic hypotension
- Teach patient to weigh daily
- Caution the patient that orthostatic hypotension may occur; patient should rise slowly from sitting or reclining positions and lie down if dizziness occurs
- Teach patient to continue taking medication even if feeling better; this product controls symptoms but does not cure the condition
- Advise the patient with hypertension to continue other medical treatment (exercise, weight loss, relaxation techniques, cessation of smoking), edema, weight gain

### Evaluation

**Positive therapeutic outcome**

- Decreased edema
- Decreased B/P
- Increased diuresis

**⚠ HIGH ALERT**

## buprenorphine (Rx) (REMS)

(byoo-pre-nor'feen)

**Belbuca, Buprenex, Butrans, Subutex**

*Func. class.:* Opioid analgesic, partial agonist

*Chem. class.:* Thebaine derivative

**Controlled substance schedule V (parenteral); schedule III (tablet)**

**Do not confuse:** Buprenex/Bumex

**ACTION:** Depresses pain impulse transmission at the spinal cord level by interacting with opioid receptors, partial agonist at MU-opioid receptor

**Therapeutic outcome:** Relief of pain

**USES:** Moderate to severe pain, opiate agonist withdrawal/dependence

**Unlabeled uses:** Cocaine

## CONTRAINDICATIONS

Hypersensitivity, ileus, status asthmaticus

**BLACK BOX WARNING:** Respiratory depression

**Precautions:** Pregnancy, breastfeeding, substance abuse/alcoholism, increased intracranial pressure, MI (acute), severe heart disease, respiratory depression, renal/hepatic/pulmonary disease, hypothyroidism, Addison's disease

**BLACK BOX WARNING:** QT prolongation, use of heating pad, accidental exposure, potential for overdose/poisoning, substance abuse, IM, neonatal opioid withdrawal syndrome, coadministration with other CNS depressants, implant insertion and removal

## DOSAGE AND ROUTES

**Adult:** IM/**IV** 0.3 mg q6-8hr prn; may repeat; reduce dosage in geriatric, may repeat after 30-60 min; EPIDURAL (unlabeled) 4 mcg/kg or 2 mcg/kg (epidural injection), remove over 48 hr; TD: each patch is worn for 7 days (moderate-severe pain); **opioid-naive patients** (those taking <30 mg oral morphine or equivalent prior to beginning treatment with TD buprenorphine), 5 mcg/hr q7days, overestimating dose can be fatal; **conversion from other opiate agonist therapy,** titrate from other opioids for up to 7 days to no more than 30 mg oral morphine or equivalent prior to beginning TD therapy, begin with 5 mcg/hr q7days; for those with daily dose of 30-80 mg oral morphine or equivalent, start with 10 mcg/hr q7days; for those >80 mg oral morphine or equivalent start with 20 mcg/hr q7days; Transmucosal: 75 mcg qd or q12hrs

**Child 2-12 yr:** IM/**IV** 2-6 mcg/kg q4-8hr

### Opiate dependence

**Adult/adolescent ≥16 yr:** SL 8 mg day 1, 16 mg day 2, then maintenance 16 mg daily

**Available forms:** Inj 0.3 mg/ml (1-ml vials); SL tab 2, 8 mg as base, TD system 5, 7.5, 10, 15, 20 mcg/hr (weekly); oral dissolving film 75, 150, ✱ 300, 450, 600, 750, 900 mcg

### Implementation

- Give by inj (IM, **IV**), only with resuscitative equipment available; give slowly to prevent rigidity

**SL route**

- Do not chew, dissolve under tongue or take 2 or more at same time

**Transdermal route (REMS)**

- Apply to clean, dry, intact skin, each patch should be worn for 7 days, do not exceed dose, QTc prolongation may occur, may use first aid tape if edge of patch is not adhering

**BLACK BOX WARNING:** Do not apply direct heat source to patch

- Apply to upper outer arm, upper chest/back, or side of chest

**IM route**

- **Give** deep in large muscle mass; rotate sites of inj

**IV route**

- **Give IV** direct undiluted over ≥3-5 min (0.3 mg/2 min); give slowly
- With antiemetic if nausea, vomiting occur
- When pain is beginning to return; determine dosage interval by patient response; rapid injection will increase side effects

**Y-site compatibilities:** Acyclovir, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, amphotericin B liposome (AmBisome), anidulafungin, ascorbic acid injection, atenolol, atracurium, atropine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, butorphanol, calcium chloride/gluconate, CARBOplatin, cefamandole, ceFAZolin, cefepime, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, cisatracurium, CISplatin, cladribine, clindamycin, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, $D_5W$-dextrose 5%, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, digoxin, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doxacurium, DOXOrubicin HCl, doxycycline, enalaprilat, ePHEDrine,

EPINEPHrine, epiRUBicin, epoetin alfa, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, inamrinone, insulin (regular), irinotecan, isoproterenol, ketorolac, labetalol, lactated Ringer's injection, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, metaraminol, methicillin, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, mezlocillin, miconazole, midazolam, milrinone, minocycline, mitoXANtrone, morphine, moxalactam, multiple vitamins injection, mycophenolate mofetil, nafcillin, nalbuphine, naloxone, nesiritide, netilmicin, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, palonosetron, pamidronate, pancuronium, papaverine, PEMEtrexed, penicillin G potassium/sodium, pentamidine, pentazocine, phenylephrine, phytonadione, piperacillin, piperacillin-tazobactam, polymyxin B, potassium chloride, procainamide, prochlorperazine promethazine, propofol, propranolol, protamine, pyridoxine, quiNIDine, raNITIdine, remifentanil, Ringer's injection, riTUXimab, rocuronium, sodium acetate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA (3-in-1), tobramycin, tolazoline, TPN, trastuzumab, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, voriconazole

**Additive incompatibilities:** DiazePAM, floxacillin, furosemide, LORazepam

## ADVERSE EFFECTS

**CNS:** *Drowsiness, dizziness, confusion, headache, sedation, euphoria,* increased intracranial pressure, amnesia, weakness, CNS depression

**CV:** Palpitations, bradycardia, change in B/P, tachycardia, QT prolongation, hypo/hypertension

**EENT:** Tinnitus, blurred vision, *miosis,* diplopia

**GI:** *Nausea,* vomiting, anorexia, constipation, cramps, dry mouth, abdominal pain, hepatotoxicity

**GU:** Dysuria, urinary retention

**INTEG:** *Rash,* urticaria, bruising, flushing, diaphoresis, pruritus

**RESP:** Respiratory depression, dyspnea, hypo/hyperventilation

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (IM) |
| **Distribution** | Crosses placenta |
| **Metabolism** | Liver, extensively by CYP3A4 |
| **Excretion** | Kidneys, feces, breast milk |
| **Half-life** | 2.2 hr (**IV**); 26 hr (transdermal); 37 hr (SL) |

### Pharmacodynamics

| | IM | IV |
|---|---|---|
| **Onset** | 15 min | Immediate |
| **Peak** | 1 hr | 5 min |
| **Duration** | 6-10 hr (Epidural route: duration is dose-dependent) | 6 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased respiratory depression, hypotension, sedation

### Drug classifications

Antidysrhythmics (class IA, III): increased QT prolongation

Antihistamines, antipsychotics, CNS depressants, MAOIs, sedatives/hypnotics, skeletal muscle relaxants: increased respiratory depression, hypotension

CYP3A4 inducers (carBAMazepine, PHENobarbital, phenytoin, rifAMPin): decreased buprenorphine effect

CYP3A4 inhibitors (erythromycin, indinavir, ketoconazole, ritonavir, saquinavir): increased buprenorphine effect

Opioids: increased CNS depression

### Drug/herb

St. John's wort: increased CNS depression

## NURSING CONSIDERATIONS

### Assessment

- Assess **pain characteristics:** location, intensity, type, severity before medication administration and after treatment 5, 15, 30 min (IV)

**BLACK BOX WARNING: Overdose:** Potential for overdose may occur from chewing, swallowing, snorting, or injecting extracted product from TD formulation

- **QT prolongation:** Assess often in those taking class Ia, III antidysrhythmics; patients with hypokalemia or cardiac instability (TD), max TD 20 mcg/hr q7 days
- Monitor VS after parenteral route; note muscle rigidity, product history, liver, kidney

function tests, respiratory dysfunction: respiratory depression, character, rate, rhythm; notify prescriber if respirations are <10/min
• **Beers:** Avoid in older adults unless safer alternatives are available, may cause impaired psychomotor function, syncope
• Monitor CNS changes: dizziness, drowsiness, hallucinations, euphoria, LOC, pupil reaction; withdrawal in opioid-dependent persons; if dependence occurs within 2 wk of discontinuing product, **withdrawal symptoms** will occur
• Monitor allergic reactions: rash, urticaria
• Monitor bowel pattern; severe constipation can occur

**BLACK BOX WARNING:** Accidental exposure: Keep away from children and pets, may be fatal

• Pregnancy/breastfeeding: Avoid use in pregnancy and breastfeeding, watch infant for decreased respiration, lethargy, decreased heart rate

### Patient/family education

• Instruct patient to report any symptoms of CNS changes, allergic reactions
• Caution patients to avoid CNS depressants: alcohol, sedative/hypnotics for at least 24 hr after taking this product

**BLACK BOX WARNING:** Advise that psychologic dependence leading to substance abuse may result when used for extended periods; long-term use is not recommended

**SL route:**
• Teach patient to place under tongue and allow to dissolve

**Transdermal route**
• Teach patient how to apply and dispose of patch
• Teach patient not to use a heating pad or other heat source, do not cut
• Advise to avoid driving, other hazardous activities until reaction is known
• Discuss with patient that dizziness, drowsiness, and confusion are common; to avoid getting up without assistance; to avoid hazardous activities
• Discuss in detail all aspects of the product
• Do not start new meds/herbs without prescriber approval
• Start stool softener/ laxatives to lessen constipation

### Evaluation

**Positive therapeutic outcome**
• Relief of pain

## TREATMENT OF OVERDOSE:

Naloxone 0.4 mg ampule diluted in 10 ml 0.9% NaCl, give by direct **IV** push 0.02 mg q2min (adult)

## buPROPion (Rx)

(byoo-proe'pee-on)
**Aplenzin, Budeprion SR Buproban, Forfivo XL, Wellbutrin, Wellbutrin SR, Wellbutrin XL, Zyban**
*Func. class.:* Antidepressant—miscellaneous, smoking deterrent
*Chem. class.:* Aminoketone

**Do not confuse:** buPROPion/busPIRone, Zyban/Diovan

**ACTION:** Inhibits reuptake of DOPamine, norepinephrine, serotonin

**Therapeutic outcome:** Decreased symptoms of depression after 2-3 wk

**USES:** Depression (Wellbutrin), smoking cessation (Zyban); seasonal affective disorder, substance abuse, glaucoma, smoking, cardiac disease, heart failure

**Unlabeled uses:** Neuropathic pain, enhancement of weight loss, attention-deficit/hyperactivity disorder (ADHD)

## CONTRAINDICATIONS

Hypersensitivity, eating disorders, seizure disorder

**Precautions:** Pregnancy, breastfeeding, geriatric, renal/hepatic disease, recent MI, cranial, head trauma, stroke, intracranial mass, trauma, seizure disorders, substance abuse, glaucoma, smoking, cardiac disease, heart failure, Tourette's syndrome, tics, tobacco smoking, abrupt discontinuation

**BLACK BOX WARNING:** Children <18 yr, suicidal thinking/behavior (young adults)

## DOSAGE AND ROUTES

### Depression

**Adult:** PO 100 mg bid initially, then increase after 3 days to 100 mg tid if needed, max 150 mg single dose; ER/SR, initially 150 mg AM, increase to 300 mg/day if initial dose is tolerated, after no less than 4 days; after several wk, titrate to 200 mg bid; Aplenzin 174 mg qAM; may increase to 348 mg qAM on day 4; may increase to 522 mg after several weeks if needed; Forfivo XL (not for initial treatment) 450 mg q day after titration with another product (300mg/day × ≥ 2 wks)
**Geriatric:** PO 50-100 mg/day, may increase by 50-100 mg q3-4days

### Smoking cessation (Zyban)

**Adult:** SR 150 mg q day × 3 days, then 150 mg bid for remainder of treatment, initiate 1-2 wk before targeted "quit day," continue for 7-12 wk; in combination with nicotine TD, 150 mg q day × 3 days, then 150 mg bid for remainder of treatment, give ≥8 hr apart, max 300 mg/day, initiate 1-2 wk before targeted "quit day," continue for 7-12 wk, may be continued for 8-20 wk

### Seasonal affective disorder

**Adult:** PO (Wellbutrin XL) 150 mg as a single dose in the AM, after 1 wk may be increased to 300 mg/day; (Aplenzin) 174 mg/day in AM, after 7 days may increase to 348 mg/day

**Available forms:** Tabs 75, 100 mg; sus rel tabs (**SR**), 100, 150, 200 mg; ext rel tab (XL) 100, 150, 300, 450 mg (SR-12 hr, XL-24 hr); ext rel tab (Aplenzin) 174, 348, 522 mg

### Implementation

- Give with food or milk for GI symptoms
- Give sugarless gum, hard candy, or frequent sips of water for dry mouth
- When switching to Aplenzin from Wellbutrin, Wellbutrin SR, or XL use these equivalents: 174 buPROPion HBr = 150 mg buPROPion HCl; 348 mg buPROPion HBr = 300 mg buPROPion HCl; 522 mg buPROPion HBr = 450 mg buPROPion HCl
- **Wellbutrin immediate rel,** separate by ≥6 hr, give in 3 divided doses; **Wellbutrin SR,** if multiple doses are used, separate by ≥8 hr; **Wellbutrin XL,** give q day in AM; Zyban SR, give in 2 divided doses ≥8 hr apart; **Aplenzin ER,** give q day in AM, a larger dose of Aplenzin is needed because these products are not equivalent
- Store at room temperature; do not freeze

## ADVERSE EFFECTS

**CNS:** *Headache, agitation, confusion,* seizures, delusions, *insomnia, sedation, tremors,* dizziness, akinesia, bradykinesia, suicidal ideation, mania, hot flashes, myoclonia, chest pain, flushing

**CV:** Dysrhythmias, *hypertension,* palpitations, *tachycardia,* hypotension, complete AV block, QRS prolongation (overdose)

**EENT:** *Blurred vision, auditory disturbance,* tinnitus

**GI:** *Nausea, vomiting, dry mouth,* anorexia, diarrhea, increased appetite, *constipation,* altered taste

**GU:** Impotence, frequency, retention, *menstrual irregularities,* nocturia, altered libido

**INTEG:** *Rash,* pruritus, *sweating,* Stevens-Johnson syndrome

**MISC:** *Weight loss or gain*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed; bioavailability poor |
| **Distribution** | Unknown |
| **Metabolism** | Liver extensively |
| **Excretion** | Kidneys |
| **Half-life** | 14 hr, steady state (immediate release) 1½-5 wk |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Up to 4 wk |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol, levodopa, theophylline: increased risk of seizures
CarBAMazepine, cimetidine, PHENobarbital, phenytoin: decreased buPROPion effect
Cimetidine: increased buPROPion levels
Ritonavir: increased buPROPion toxicity
Tamoxifen: decreased effect of tamoxifen
Do not use within 14 days of MAOIs

### Drug classifications

Antidepressants, benzodiazepines, MAOIs, phenothiazines, steroids (systemic): increased risk of seizures
CYP2D6/CYP2B6 inhibitors: increased buPROPion effect
CYP450, CYP2D6 products: decreased buPROPion effects
CYP2D6, CYP2B6 inducers: decreased buPROPion effect
MAOIs: acute toxicity

### Drug/herb

Kava, valerian: increased CNS depression

### Drug/lab test

Positive urine drug screen for amphetamine possible

## NURSING CONSIDERATIONS

### Assessment

- Monitor B/P (with patient lying, standing), pulse q4hr; if systolic B/P drops 20 mm Hg hold product, notify prescriber; take vital signs q4hr in patients with CV disease
- Assess smoking cessation progress after 7-12 wk, if progress has not been made, product should be discontinued
- Assess for increased risk of seizures; if patient has used CNS depressant or CNS stimulants, dosage of buPROPion should not be exceeded

• Monitor blood studies: CBC, leukocytes, differential, cardiac enzymes if patient is receiving long-term therapy
• Monitor hepatic studies: AST, ALT, bilirubin if on long-term treatment
• Check weight weekly; appetite may increase with product
• Assess ECG for flattening of T wave, bundle branch block, AV block, dysrhythmias in cardiac patients
• Assess for EPS primarily in geriatric: rigidity, dystonia, akathisia

**BLACK BOX WARNING:** Assess mental status: mood, sensorium, affect, suicidal tendencies; increase in psychiatric symptoms: depression, panic

• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk
• **Beers:** Avoid in older adults, lowers seizure threshold, may be acceptable in those with well-controlled seizures, where other treatment hasn't been effective
• Monitor urinary retention, constipation; constipation is more likely to occur in children or geriatric
• Identify alcohol consumption; if alcohol was consumed, hold dose

### Patient/family education

• Teach patient that therapeutic effects may take 2-3 wk; not to increase dose without prescriber's approval; that treatment for smoking cessation lasts 7-12 wk
• Teach patient to use caution in driving or other activities requiring alertness because of drowsiness, dizziness, blurred vision; to avoid rising quickly from sitting to standing, especially geriatric
• Teach patient to avoid alcohol ingestion; alcohol may increase risk of seizures, obtain approval for other products
• Teach patient to increase fluids, bulk in diet if constipation, urinary retention occur, especially geriatric; notify prescriber immediately if urinary retention occurs
• Teach patient to take gum, hard sugarless candy, or frequent sips of water for dry mouth
• Advise patient not to use with nicotine patches unless directed by prescriber, may increase B/P

**BLACK BOX WARNING:** Teach patient that risk of seizures increases when dose is exceeded or if patient has seizure disorder; suicidal ideas, behavior, hostility, depression may occur in children or young adults

• Teach patient to notify prescriber if pregnancy is suspected or planned
• Report hearing, visual, CNS changes
• May need to use stool softener/laxative

### Evaluation

**Positive therapeutic outcome**
• Decrease in depression
• Absence of suicidal thoughts
• Smoking cessation

## TREATMENT OF OVERDOSE:

ECG monitoring, induce emesis, lavage, administer anticonvulsant

**⚠ HIGH ALERT**

## busPIRone (Rx)

(byoo-spye′rone)
**BuSpar, BuSpar Dividose, Buspirex, Bustab, PMS-Buspirone**
*Func. class.:* Antianxiety, sedative
*Chem. class.:* Azaspirodecanedione

**Do not confuse:** busPIRone/buPROPion

**ACTION:** Acts by inhibiting the action of serotonin (5-HT) by binding to serotonin and DOPamine receptors; also increases norepinephrine metabolism; has shown little potential for abuse, a good choice in substance abuse

**Therapeutic outcome:** Decreased anxiety

**USES:** Management and short-term relief of generalized anxiety disorders

## CONTRAINDICATIONS

Hypersensitivity, child <18 yr

**Precautions:** Pregnancy, breastfeeding, geriatric, impaired renal/hepatic function

## DOSAGE AND ROUTES

**Adult:** PO 7.5 mg bid; may increase by 5 mg/day q2-3days; max 60 mg/day

### Renal/hepatic dose

**Adult:** PO reduce by 25%-50% in mild to moderate hepatic disease, do not use in severe hepatic disease, CCr 11-70 ml/min reduce dose by 25%-50%, CCr <10 ml/min do not use

**Available forms:** Tabs 5, 7.5, 10, 15, 30 mg

### Implementation

• Give with food or milk for GI symptoms (avoid grapefruit juice); sugarless gum, hard candy, frequent sips of water for dry mouth
• May be crushed

## ADVERSE EFFECTS

**CNS:** *Dizziness, headache, depression, stimulation, insomnia, nervousness, light-headedness, numbness, paresthesia, incoordination, tremors,* excitement, involuntary movements, confusion, akathisia, nightmares, hostility

**CV:** *Tachycardia, palpitations,* hypo/hypertension, CVA, HF, MI, chest pain

**EENT:** *Sore throat, tinnitus, blurred vision, nasal congestion,* red, itching eyes, change in taste, smell

**GI:** *Nausea, dry mouth, diarrhea, constipation,* flatulence, increased appetite, rectal bleeding

**GU:** Frequency, hesitancy, menstrual irregularity, change in libido

**INTEG:** *Rash,* edema, pruritus, alopecia, dry skin

**MISC:** *Sweating,* fatigue, weight gain, fever, serotonin syndrome

**MS:** *Pain, weakness,* muscle cramps, spasms, myalgia

**RESP:** Hyperventilation, chest congestion, shortness of breath

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid |
| **Distribution** | Protein binding 86% |
| **Metabolism** | Liver, extensively |
| **Excretion** | Feces |
| **Terminal half-life** | 2-4 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 40-90 min |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression; avoid use

### Drug classifications

Products metabolized by CYP3A4 (erythromycin, itraconazole, nefazodone, ketoconazole, ritonavir, verapamil, dilTIAZem, several other protease inhibitors): increased busPIRone levels

MAOIs, procarbazine: increased B/P, do not use together

Products induced by CYP3A4 (rifAMPin, phenytoin, PHENobarbital, carBAMazepine, dexamethasone): decreased busPIRone action

Psychotropics: increased CNS depression, avoid use

Selective serotonin reuptake inhibitors (SNRIs, serotonin receptor agonists): increase serotonin syndrome

### Drug/food

Grapefruit juice: increased peak concentration of busPIRone

## NURSING CONSIDERATIONS

### Assessment

- Assess anxiety reaction: inability to sleep, apprehension, dread, foreboding, or uneasiness related to unidentified source of danger
- Assess for previous product dependence or tolerance; if patient is product dependent or tolerant, amount of medication should be restricted
- Monitor B/P (lying, standing), pulse; if systolic B/P drops 20 mm Hg, hold product, notify prescriber; check I&O; may indicate renal dysfunction
- Monitor mental status: mood, sensorium, affect, sleeping patterns, drowsiness, dizziness, suicidal tendencies; withdrawal symptoms when dose is reduced or product discontinued
- Assess for CNS reaction, some reactions may be unpredictable
- **Pregnancy/breastfeeding:** Avoid in pregnancy/breastfeeding
- **Beers:** Avoid in older adults with delirium or a high risk of delirium

### Patient/family education

- Teach patient that product may be taken consistently with or without food; if dose is missed take as soon as remembered; do not double doses
- Caution patient to avoid OTC preparations unless approved by the prescriber; to avoid alcohol ingestion and other psychotropic medications unless prescribed; that 2 wk of therapy may be required before therapeutic effects occur; to avoid large amounts of grapefruit juice, max effect 3-6 wk
- Caution patient to avoid driving and activities requiring alertness since drowsiness may occur; until medication response is known, tell patient that drowsiness may worsen at beginning of treatment
- Instruct patient not to discontinue medication abruptly after long-term use; if dose is missed, do not double
- Advise patient to rise slowly or fainting may occur, especially in geriatric
- **Serotonin syndrome:** Teach patient to report immediately (fever, tremor, sweating, diarrhea, delirium)

### Evaluation

**Positive therapeutic outcome**

- Increased well-being
- Decreased anxiety, restlessness, sleeplessness, dread

## busulfan (Rx)

(byoo-sul′fan)
**Busulfex, Myleran**
*Func. class.:* Antineoplastic alkylating agent
*Chem. class.:* Bifunctional alkylating agent

**Do not confuse:** Alkeran/Myleran

**USES:** Chronic myelocytic leukemia, bone marrow ablation, stem cell transplant preparation in CML

### CONTRAINDICATIONS

Pregnancy (3rd trimester), breastfeeding, radiation, chemotherapy, blastic phase of chronic myelocytic leukemia, hypersensitivity

### DOSAGE AND ROUTES

**Chronic myelocytic leukemia**

**Adult:** PO 4-8 mg/day or 1.8-4 mg/m²/day initially; reduce dosage if WBC levels reach 30,000-40,000/mm³; stop if WBC ≤20,000/mm³; maintenance 1-3 mg/day
**Child:** PO 0.06-0.12 mg/kg/day or 1.8-4.6 mg/m²/day, reduce if WBC is 30,000-40,000/mm³; discontinue if WBC ≤20,000/mm³

**Allogenic hemopoietic stem cell transplantation in chronic myelogenous leukemia**

**Adult:** **IV** 0.8 mg/kg over 2 hr, q6hr × 4 days (total 16 doses); give cyclophosphamide **IV** 60 mg/kg over 1 hr/day for 2 days, starting after 16th dose of busulfan

**Available forms:** Tabs 2 mg; sol for inj 6 mg/ml

### ADVERSE EFFECTS

**CV:** *Hypotension,* thrombosis, *chest pain,* tachycardia, atrial fibrillation, heart block, pericardial effusion, cardiac tamponade (high dose with cyclophosphamide)
**GI:** Anorexia, constipation, dry mouth, nausea, vomiting, *diarrhea*
**RESP:** Alveolar hemorrhage, atelectasis, cough, hemoptysis, hypoxia, pleural effusion, pneumonia, sinusitis, pulmonary fibrosis
**CNS:** *Depression, dizziness, insomnia, headache*
**EENT:** *Blurred vision*
**GU:** Impotence, sterility, amenorrhea, gynecomastia, renal toxicity, hyperuremia, adrenal insufficiency–like syndrome
**HEMA:** Thrombocytopenia, leukopenia, pancytopenia, severe bone marrow depression
**INTEG:** Dermatitis, hyperpigmentation, alopecia
**MISC:** Chromosomal aberrations
**RESP:** Irreversible pulmonary fibrosis, pneumonitis

- Advise patient that contraception is needed during treatment and for ≥3 months after the completion of therapy (pregnancy); avoid breastfeeding; may cause infertility; discuss family planning before initiating therapy

**Evaluation**

**Positive therapeutic outcome**

- Decreased leukocytes to normal limits
- Absence of sweating at night
- Increased appetite, increased weight

## butoconazole vaginal antifungal

*See Appendix B*

**⚠ HIGH ALERT**

## butorphanol (Rx)

(byoo-tor′fa-nole)
**Stadol**
*Func. class.:* Mixed opiate analgesic
*Chem. class.:* Opioid antagonist, partial agonist
**Controlled substance schedule IV**

**ACTION:** Depresses pain impulse transmission at the spinal cord level by interacting with opioid receptors

**Therapeutic outcome:** Relief of pain

**USES:** Moderate to severe pain, general anesthesia induction/maintenance, headache, migraine, preanesthesia

### CONTRAINDICATIONS

Hypersensitivity to this product or preservative, addiction (opioid)

**Precautions:** Pregnancy, breastfeeding, child <18 yr, addictive personality, increased ICP, renal/hepatic disease, ileus, COPD

**BLACK BOX WARNING:** Coadministration with other CNS depressants, respiratory depression

### DOSAGE AND ROUTES

**Moderate to severe pain**

**Adult:** IM 1-4 mg q3-4hr prn; **IV** 0.5-2 mg q3-4hr prn; **nasal** spray in 1 nostril; may give another dose 1-1½ hr later; may repeat if needed in q3-4hr after last dose

**Geriatric: IV** ½ adult dose at 2× the interval; **intranasal** if no relief in 90-120 min, may repeat with 1 spray

### Severe pain

**Adult:** INTRANASAL 1 spray in each nostril q3-4hr

### Renal/hepatic dose

**Adult:** INTRANASAL max 1 mg, followed by 1 mg in 90-120 min; IM/IV give 50% of dose (0.5 mg IV, 1 mg IM); do not repeat within 6 hr

**Available forms:** Inj 1, 2 mg/ml; INTRANASAL 10 mg/ml

### Implementation

- Store in light-resistant container at room temperature

**Nasal route**

- Prime before first use, point sprayer away from face, pump activator 7 times until a fine, wide spray occurs; if not used for 48 hr, reprime by pumping 1-2 times
- If more than 1 spray is needed, use other nostril
- Do not share with others
- Nasal congestion/irritation may occur

**IM route**

- Give deeply in large muscle mass; rotate inj sites

**Intranasal route**

- Give 1 spray in nostril
- Remove clip and cover, prime before using until spray appears; pump must be reprimed q48hr; close nostril with finger and spray once quickly; have patient sniff

**IV direct route**

- Give **IV** undiluted at a rate of ≤2 mg/>3-5 min; titrate to patient response

**Y-site compatibilities:** Acyclovir, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amphotericin B liposome (AmBisome), anidulafungin, ascorbic acid injection, atenolol, atracurium, atropine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, calcium chloride/gluconate, CARBOplatin, caspofungin, cefamandole, ceFAZolin, cefepime, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, ceftRIAXone, cefuroxime, cephalothin, chlorproMAZINE, cimetidine, cisatracurium, CISplatin, cladribine, clindamycin, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone phosphate, dexmedetomidine, digoxin, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doxacurium, DOXOrubicin, DOXOrubicin liposomal, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, epoetin alfa, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, fluorouracil, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, irinotecan, isoproterenol, ketorolac, labetalol, lactated Ringer's injection, levofloxacin, lidocaine, linezolid injection, LORazepam, magnesium, mannitol, mechlorethamine, melphalan, meperidine, metaraminol, methicillin, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, mezlocillin, milrinone, minocycline, mitoXANtrone, morphine, multiple vitamins injection, mycophenolate mofetil, nafcillin, nalbuphine, naloxone, nesiritide, netilmicin, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, palonosetron, pamidronate, pancuronium, papaverine, PEMEtrexed, penicillin G potassium/sodium, pentazocine, PHENobarbital, phenylephrine, phytonadione, piperacillin, piperacillin-tazobactam, polymyxin B, potassium chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, pyridoxine, quiNIDine, raNITIdine, remifentanil, Ringer's injection, riTUXimab, rocuronium, sargramostim, sodium acetate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA, tobramycin, tolazoline, TPN, trastuzumab, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, voriconazole

## ADVERSE EFFECTS

**CNS:** *Drowsiness, dizziness, confusion, headache, sedation, euphoria, weakness, hallucinations*, insomnia (nasal)
**CV:** Palpitations, bradycardia, hypotension
**EENT:** Tinnitus, blurred vision, miosis, diplopia, nasal congestion, unpleasant taste
**GI:** *Nausea, vomiting, anorexia, constipation, cramps*
**GU:** Urinary retention
**INTEG:** Rash, urticaria, bruising, flushing, diaphoresis, pruritus
**RESP:** Respiratory depression

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (IM, nasal); complete (**IV**) |
| **Distribution** | Crosses placenta, protein binding 80% |
| **Metabolism** | Liver, extensively |
| **Excretion** | Feces (10%-15%); kidneys, unchanged (small amounts) |
| **Half-life** | 2-9 hr |

### Pharmacodynamics

| | IM | IV | Nasal |
|---|---|---|---|
| **Onset** | 5-15 min | 1 min | 15 min |
| **Peak** | 30-60 min | 4-5 min | 1-2 hr |
| **Duration** | 3-4 hr | 2-4 hr | 4-5 hr |

## INTERACTIONS

### Individual drugs

**BLACK BOX WARNING:** Alcohol: increased respiratory depression, hypotension, sedation

### Drug classifications

**BLACK BOX WARNING:** Antipsychotics, CNS depressants, opioids, MAOIs, sedative/hypnotics, skeletal muscle relaxants: increased respiratory depression, hypotension

MAOIs: do not use 2 wk before butorphanol, fatal reaction

## NURSING CONSIDERATIONS

### Assessment

- Monitor VS after parenteral administration; note muscle rigidity, product history, liver, kidney function tests, respiratory dysfunction: respiratory depression, character, rate, rhythm; notify prescriber if respirations are <10/min

**BLACK BOX WARNING:** Monitor CNS changes: dizziness, drowsiness, hallucinations, euphoria, LOC, pupil reaction

- Monitor allergic reactions: rash, urticaria
- Assess for withdrawal symptoms in opioid-dependent patient; pulmonary embolism, vascular occlusion, abscesses, ulcerations
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, usually compatible with breastfeeding

### Patient/family education

- Instruct patient to report any symptoms of CNS changes, allergic reactions; to avoid CNS depressants: alcohol, sedative/hypnotics for at least 24 hr after taking this product
- Discuss with patient that dizziness, drowsiness, and confusion are common; to avoid getting up without assistance, hazardous activities
- Discuss in detail all aspects of the product

**Nasal route**

- Teach patient to blow nose to clear both nostrils before using
- Patient should replace clip and cover after use; caution patient not to shake medication
- Teach patient how to use nasal product
- Teach patient to avoid hazardous activities

### Evaluation

**Positive therapeutic outcome**

- Pain relief

## TREATMENT OF OVERDOSE:

Narcan 0.4-2 mg **IV**, $O_2$, **IV** fluids, vasopressors

baclofen (Rx)
beclomethasone nasal agent
belinostat
benzocaine topical
betamethasone (augmented) topical
bezlotoxumab
bismuth subsalicylate (OTC)
bleomycin (Rx)
bosutinib
brinzolamide ophthalmic
budesonide (Rx)
buprenorphine (Rx)
busulfan (Rx)
basiliximab (Rx)
belatacept (Rx)
benazepril (Rx)
benztropine (Rx)
betaxolol ophthalmic
bimatoprost ophthalmic
bisoprolol (Rx)
bortezomib (Rx)
brentuximab (Rx)
bromfenac ophthalmic
budesonide nasal agent
buPROPion (Rx)
butoconazole vaginal antifungal
beclomethasone (Rx)
belimumab (Rx)
bendamustine (Rx)
betamethasone topical
bevacizumab (Rx)
bisacodyl (Rx, OTC)
bivalirudin (Rx)
bosentan (Rx)
brimonidine ophthalmic
bromocriptine (Rx)
bumetanide (Rx)
busPIRone (Rx)
butorphanol (Rx)

## calcitonin (salmon) (Rx)

**Calcimar, Caltine, Miacalcin**

*Func. class.:* Parathyroid agents (calcium regulator)

*Chem. class.:* Polypeptide hormone

**Do not confuse:** Fortical/Foradil

**ACTION:** Decreases bone resorption, blood calcium levels; increases deposits of calcium in bones; opposes parathyroid hormone

**Therapeutic outcome:** Lowered calcium level, decreasing symptoms of Paget's disease

**USES:** Paget's disease, postmenopausal osteoporosis, hypercalcemia

## CONTRAINDICATIONS

Hypersensitivity to this product or fish

**Precautions:** Pregnancy, breastfeeding, children, hypotension, hypocalcemia, secondary malignancy

## DOSAGE AND ROUTES

### Postmenopausal osteoporosis

**Adult:** SUBCUT/IM 100 units/day; nasal 200 units (1 spray) alternating nostrils daily, activate pump before 1st dose

### Paget's disease

**Adult:** SUBCUT/IM 100 units daily, maintenance 50-100 units daily or every other day, or 3 × per wk

### Hypercalcemia

**Adult:** SUBCUT/IM 4 units/kg q12hr, increase to 8 units/kg q12hr if response is unsatisfactory, no more than 4-7 days

**Available forms:** Inj 200 units/ml; nasal spray 200 units/actuation

### Implementation

- Store at <77° F (25° C); protect from light

**SUBCUT route**

- Rotate inj sites

**IM route (salmon)**

- **Give** after test dose of 10 international units/ml, 0.1 ml intradermally; watch 15 min; **give** only with EPINEPHrine and emergency meds available
- IM inj in deep muscle mass slowly; rotate sites; preferred route if volume is >2 ml, use within 2 hr of reconstitution

**Nasal route**

- Use alternating nostrils for nasal spray; allow to warm to room temperature, prime to get full spray

**Intranasal route**

- Prime pump before first use
- Use at bedtime, alternate nostrils qday
- Allow to come to room temperature before using
- Discard after 30 days

## ADVERSE EFFECTS

**CNS:** Headache, tetany, chills, weakness, dizziness, fever, tremors
**CV:** Chest pressure, hypertension
**EENT:** Nasal congestion, eye pain
**GI:** Nausea, diarrhea, vomiting, anorexia, abdominal pain, salty taste, epigastric pain
**GU:** Diuresis, nocturia, urine sediment, frequency, cystitis
**INTEG:** Rash, flushing, pruritus of earlobes, edema of feet, inj site reaction
**MS:** Swelling, tingling of hands, backache, myalgia
**RESP:** Dyspnea, flulike symptoms
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Completely absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Rapid; kidneys, tissue, blood |
| **Excretion** | Kidneys, inactive metabolite |
| **Half-life** | 1 hr |

### Pharmacodynamics

| | SUBCUT |
|---|---|
| **Onset** | 15 min |
| **Peak** | 4 hr |
| **Duration** | 8-24 hr |

## INTERACTIONS

### Individual drugs

Lithium: decreased lithium effect, monitor lithium level

### Drug classifications

Bisphosphonates (Paget's disease): decreased effect of nasal spray, monitor for adequate effect

## NURSING CONSIDERATIONS

### Assessment

- **Anaphylaxis, hypersensitivity:** inability to breathe, rash, fever; have emergency equipment nearby
- Assess for GI symptoms, polyuria, flushing, head swelling, tingling, headache; may indicate hypercalcemia; nervousness, irritability, twitching, seizures, spasm, paresthesia indicate hypocalcemia during beginning of treatment
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, avoid breastfeeding

• Identify nutritional status; check diet for sources of vit D (milk, some seafood), calcium (dairy products, dark green vegetables), phosphates
• **Postmenopausal osteoporosis:** Monitor BUN, creatinine, uric acid, chloride, electrolytes, urine pH, urinary calcium, magnesium, phosphate, urinalysis; vit D 50-135 international units/dl), alkaline phosphatase baseline and q3-6mo; check urine sediment for casts throughout treatment; monitor urine hydroxyproline in Paget's disease, biochemical markers of bone formation/absorption, radiologic evidence of fracture; bone density (osteoporosis)
• **Toxicity (can occur rapidly):** Assess for increased product level, since toxic reactions occur rapidly; have parenteral calcium or gluconate on hand if calcium level drops too low; check for tetany (irritability, paresthesia, nervousness, muscle twitching, seizure, tetanic spasm)

### Patient/family education

• Teach patient to report difficulty swallowing immediately

**SUBCUT route/ IM route**

• Teach method of inj if patient will be responsible for self-medication
• Instruct patient to notify prescriber for hypercalcemic relapse: renal calculi, nausea, vomiting, thirst, lethargy, deep bone or flank pain
• Teach patient that warmth and flushing occur and last 1 hr
• Provide a low-calcium diet as prescribed (Paget's disease, hypercalcemia)
• **Pregnancy/breastfeeding:** Advise prescriber if pregnancy is planned or suspected, avoid breastfeeding

**Postmenopausal osteoporosis**

• Teach patient to take vitamin D and calcium as directed
• Teach patient that nausea, vomiting, and facial flushing occur often

**Nasal route**

• Teach patient to use alternating nostrils for nasal spray; use after warming to room temperature, prime to get full spray, discard after 30 days, report serious symptoms of rhinitis
• Advise patients with osteoporosis to increase calcium and vit D in diet and to continue with moderate exercise to prevent continued bone loss
• Advise patients to report difficulty swallowing or change in side effects to prescriber immediately

### Evaluation

**Positive therapeutic outcome**

• Calcium levels 9-10 mg/dl
• Decreasing symptoms of Paget's disease, including pain
• Decreased bone loss in osteoporosis



## calcitriol (Rx)

(kal-si-tree'ole)
**Calcijex ✱, Rocaltrol, Silkis ✱, Vectical**
*Func. class.:* Parathyroid agent (calcium regulator)
*Chem. class.:* Vitamin D hormone

**Do not confuse:** calcitriol/Calciferol

**ACTION:** Increases intestinal absorption, renal reabsorption of calcium, provides calcium for bones, increases renal tubular resorption of phosphate

**Therapeutic outcome:** Calcium at normal level

**USES:** Hypocalcemia in chronic renal disease, hyperparathyroidism, pseudohypoparathyroidism, psoriasis, renal osteodystrophy

## CONTRAINDICATIONS

Hypersensitivity, hyperphosphatemia, hypercalcemia, vit D toxicity

**Precautions:** Pregnancy, breastfeeding, renal calculi, CV disease

## DOSAGE AND ROUTES

### Hypocalcemia (stage 5 chronic kidney disease, on dialysis)

**Adult and child ≥6 yr: PO** 0.25 mcg/day
**IV** 1-2 mcg three times/wk, initially; may increase by 0.5-1 mcg q4-8wk
**Child 1-5 yr: PO** 0.25-2 mcg/day

### Renal osteodystrophy

**Adult and child ≥3 yr: PO** 0.25 mcg/day, may increase to 0.5 mcg/day
**Child <3 yr: PO** 0.01-0.015 mcg/kg/day

### Hypoparathyroidism

**Adult and child ≥6 yr: PO** 0.25 mcg/day, may increase q2-4wk, maintenance 0.5-2 mcg/day
**Child 1-5 yr: PO** 0.25-0.75 mcg daily
**Child <1 yr: PO** 0.04-0.08 mcg/kg/day

**Available forms:** Caps 0.25, 0.5 mcg; inj 1 mcg/ml, 2 mcg/ml; oral sol 1 mcg/ml; top 3 mcg/g

### Implementation

**PO route**

• Do not break, crush, or chew caps
• Give with meals for GI symptoms
• Store protected from light, heat, moisture

**Topical route**

• Rub into skin

**IV route**
• **Hypocalcemia** Give by direct **IV** over 1 min through catheter at hemodialysis conclusion

## ADVERSE EFFECTS

**CNS:** Drowsiness, headache, vertigo, fever, lethargy, hallucinations
**CV:** Palpitations, hypertension, dysrhythmias
**ENDO:** Hypercalcemia
**EENT:** Blurred vision, photophobia
**GI:** Nausea, diarrhea, vomiting, jaundice, anorexia, dry mouth, constipation, cramps, metallic taste
**GU:** Polyuria, hypercalciuria, hyperphosphatemia, hematuria, thirst
**MS:** Myalgia, arthralgia, decreased bone development, weakness
**SYST:** Anaphylaxis
**INTEG:** Pain at injection site, rash, pruritus

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | To liver, crosses placenta |
| **Metabolism** | Liver |
| **Excretion** | Bile |
| **Half-life** | 3-6 hr, undergoes hepatic recycling, excreted in bile |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 2-6 hr |
| **Peak** | 10-12 hr |
| **Duration** | Up to 5 days |

## INTERACTIONS

### Individual drugs

Cholestyramine, mineral oil: decreased absorption of calcitriol, avoid concurrent use
Phenytoin: increased vit D metabolism
Verapamil: increased dysrhythmias use cautiously

### Drug classifications

Antacids (magnesium): increased hypermagnesemia
Calcium supplements, diuretics (thiazide): increased hypercalcemia
Cardiac glycosides: increased dysrhythmias
Vitamin D products: increased toxicity
Vitamins (fat-soluble): decreased calcitriol absorption

### Drug/food

Large amounts of high-calcium foods may cause hypercalcemia

### Drug/lab test

Increase: AST/ALT, BUN, creatinine
False: increased cholesterol
Interference: alkaline phosphatase, electrolytes

## NURSING CONSIDERATIONS

### Assessment

• Assess GI symptoms, polyuria, flushing, head swelling, tingling, headache; may indicate hypercalcemia
• **Hypercalcemia:** dry mouth, metallic taste, polyuria, bone pain, muscle weakness, headache, fatigue, change in LOC, dysrhythmias, increased respirations, anorexia, nausea, vomiting, cramps, diarrhea, constipation, confusion, paresthesia, twitching, Chvostek's/Trousseau's sign, **hypocalcemia**
• Identify nutritional status; check diet for sources of vit D (milk, some seafood), calcium (dairy products, dark green vegetables), phosphates
• Monitor BUN, creatinine, uric acid, chloride, electrolytes, urine pH, urinary calcium, magnesium, phosphate, urinalysis (calcium should be kept at 9-10 mg/dl; vit D 50-135 international units/dl), alkaline phosphatase baseline and q3-6mo
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, no well-controlled studies, do not breastfeed
• **Vitamin D toxicity:** Assess for constipation, nausea, vomiting, headache, metal taste, anorexia, weakness, weight loss

### Patient/family education

• Teach patient the symptoms of hypercalcemia (renal stones, nausea, vomiting, anorexia, lethargy, thirst, bone or flank pain) and about foods rich in calcium
• Advise patient to avoid products with sodium: cured meats, dairy products, cold cuts, olives, beets, pickles, soups, meat tenderizers in chronic renal failure
• Advise patient to avoid products with potassium: oranges, bananas, dried fruit, peas, dark green leafy vegetables, milk, melons, beans in chronic renal failure
• Advise patient to avoid OTC products containing calcium, potassium, or sodium in chronic renal failure
• Instruct patient to avoid all preparations containing vit D
• Instruct patient to monitor weight weekly; maintain fluid intake

### Evaluation

**Positive therapeutic outcome**
• Calcium levels 9-10 mg/dl

## calcium acetate (OTC)

(kal'see-um ass'e-tate)

**Calphron, Eliphos, PhosLo, Phoslyra**

## calcium carbonate (Rx) (PO-OTC, Rx)

**Alka-Mints, Amitone, Apo-Cal, BioCal, Calcarb, Calci-Chew, Calciday, Calci-Mix, Calcite, Caltrate, Chooz, Maalox Antacid, Os-Cal, Rolaids Extra Strength Soft-chew, Tums, Tums E-X, Tums Kids, Tums Lasting Effects, Tums Dissolve, Tums Smoothies, Tums Ultra**

*Func. class.:* Antacid, calcium supplement

*Chem. class.:* Calcium product

**Do not confuse:** Os-Cal/Asacol

**ACTION:** Neutralizes gastric acidity

**Therapeutic outcome:** Neutralized gastric acidity; calcium at normal levels

**USES:** Antacid, calcium supplement; not suitable for chronic therapy, hyperphosphatemia, hypertension in pregnancy, osteoporosis, prevention/treatment of hypocalcemia, hypoparathyroidism

## CONTRAINDICATIONS

Hypersensitivity, hypercalcemia

**Precautions:** Pregnancy, breastfeeding, geriatric, fluid restriction, decreased GI motility, GI obstruction, dehydration, renal disease, hyperparathyroidism, bone tumors

## DOSAGE AND ROUTES

### Nutritional supplement including osteoporosis prophylaxis

**Adult ≥51 yr: PO** 1000-1500 mg/day elemental calcium (2500-3750 calcium carbonate)

**Adult 19-50 yr: PO** 1000 mg/day elemental calcium (2500 mg calcium carbonate)

### Chronic hypocalcemia

**Adult: PO** 2-4 g/day elemental calcium (5-10 g calcium carbonate) in 3-4 divided doses

**Child: PO** 45-65 mg/kg/day elemental calcium (112.5-162.5 mg/kg calcium carbonate) in 4 divided doses

**Neonate: PO** 50-150 mg/kg/day elemental calcium (125-375 mg/kg/day in 4-6 divided doses, max 1 g/day)

### Supplementation

**Adolescent and child 9-18 yr: PO** 1300 mg elemental calcium (3250 mg calcium carbonate)

**Child 4-8 yr: PO** 800 mg/day elemental calcium (2000 mg calcium carbonate)

**Child 1-3 yr: PO** 500 mg/day elemental calcium (1250 mg calcium carbonate)

**Infant 6-12 mo: PO** 270 mg/day elemental calcium based on total intake

**Neonate and infant <6 mo: PO** 210 mg/day elemental calcium based on total intake

### Hyperphosphatemia

**Adult: PO** Individualized on response

### Heartburn, dyspepsia, hyperacidity (OTC)

**Adult: PO** 1-2 tabs q2hr, max 9 tabs/24 hr (Alka-mints); chew 2-4 tab q1hr prn, max 16 tabs (Tums regular strength); chew 2-4 tab q1hr prn, max 10 tabs (Tums E-X); chew 2-3 tabs q1hr prn, max 10 tabs/24 hr (Tums Ultra)

**Available forms: Calcium carbonate: chewable tabs** 350, 420, 450, 500, 750, 1000, 1250 mg; **tabs** 500, 600, 650, 667, 1000, 1250, 1500 mg; **gum** 300, 450 500 mg; **susp** 1250 mg/5 ml; **caps** 1250 mg; **powder** 6.5 g/packet; **calcium acetate: tabs** 667 mg (169 mg Ca), **caps** 500 mg (125 mg Ca); **gelcaps:** 667 mg (169 mg elemental Ca)

### Implementation

**PO route**

- Administer as antacid 1 hr after meals and at bedtime
- Administer as supplement 1½ hr after meals and at bedtime
- Administer only with regular tablets or capsules; do not give with enteric-coated tablets
- Administer laxatives or stool softeners if constipation occurs

## ADVERSE EFFECTS

**GI:** *Constipation,* anorexia, nausea, vomiting, flatulence, diarrhea, rebound hyperacidity, eructation

**GU:** Calculi, hypercalciuria

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | ⅓ absorbed by small intestines, must have adequate vit D for absorption |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Feces, urine, crosses placenta |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Peak** | Unknown |

## INTERACTIONS

### Individual drugs

Atenolol, etidronate, phenytoin, risedronate, ketoconazole: decreased levels of each drug
Digoxin: increased toxicity from hypercalcemia
QuiNIDine: increased quiNIDine levels

### Drug classifications

Amphetamines: increased levels of amphetamines
Calcium channel blockers, calcium supplements, fluoroquinolones, iron products, salicylates, tetracyclines: PO decreased levels of each specific product
Thiazide diuretics: increased hypercalcemia

### Drug/lab test

Decrease: phosphates
False increase: chloride
False decrease: magnesium, oxalate, lipase
False positive: benzodiazepines

## NURSING CONSIDERATIONS

### Assessment

- Monitor $Ca^+$ (serum, urine); $Ca^+$ should be 8.5-10.5 mg/dl, urine $Ca^+$ should be 150 mg/day, monitor weekly
- **Assess for milk-alkali syndrome:** nausea, vomiting, disorientation, headache
- Assess for constipation; increase bulk in the diet if needed
- Assess for **hypercalcemia:** headache, nausea, vomiting, confusion; hypocalcemia: paresthesia, twitching, colic, dysrhythmias, Chvostek's/Trousseau's sign
- Assess those taking digoxin for toxicity
- Assess those taking for abdominal pain, heartburn, indigestion before, after administration
- **Pregnancy/breastfeeding:** Use only if clearly needed, no well-controlled studies, considered compatible with breastfeeding

### Patient/family education

- Advise patient to increase fluids to 2 L unless contraindicated, to add bulk to diet for constipation; notify prescriber of constipation
- Advise patient not to switch antacids unless directed by prescriber, not to use as antacid for >2 wk without approval by prescriber
- Teach patient that therapeutic dose recommendations are figured as elemental calcium
- Advise to avoid excessive use of alcohol, caffeine, tobacco
- Teach to avoid spinach, cereals, dairy products in large amounts

### Evaluation

**Positive therapeutic outcome**

- Absence of pain, decreased acidity
- Decreased hyperphosphatemia in renal failure (Acetate)

## CALCIUM SALTS

**calcium chloride (Rx)**
**calcium citrate (OTC)**
Cal-Citrate
Citracal
**calcium glubionate**
calcionate
**calcium gluceptate (Rx)**
**calcium gluconate (Rx)**
**calcium phosphate (OTC)**
*Func. class.:* Electrolyte replacement—calcium product

**ACTION:** Calcium needed for maintenance of nervous, muscular, skeletal systems, enzyme reactions, normal cardiac contractility, coagulation of blood; affects secretory activity of endocrine, exocrine glands

**Therapeutic outcome:** Calcium at normal level, absence of increased magnesium, potassium

**USES:** Prevention and treatment of hypocalcemia, hypermagnesemia, hypoparathyroidism, neonatal tetany, cardiac toxicity caused by hyperkalemia, lead colic, hyperphosphatemia, vit D deficiency, osteoporosis prophylaxis, calcium antagonist toxicity (calcium channel blocker toxicity)

## CONTRAINDICATIONS

Hypercalcemia, digoxin toxicity, ventricular fibrillation, renal calculi

**Precautions:** Pregnancy, breastfeeding, children, renal disease, respiratory disease, cor pulmonale, digitalized patient, respiratory failure, diarrhea, dehydration

## DOSAGE AND ROUTES

### >> Acute hypocalcemia (calcium chloride 10%):

**Adults: IV** 0.5-1 g; **for tetany**, give over 5-10 min. Repeat q4-6 hrs, as needed by calcium concentrations or **IV INF** 15 mg/kg of elemental calcium (37.5 mg/kg calcium chloride) over 4-6 hr.
**Child/infant:** IV range from 2.7-5 mg/kg/dose (0.027-0.05 ml/kg/dose of 10%). **For tetany**, slow IV 10 mg/kg/dose over 5-10 min, may repeat initial dosage in 4-6 hr. The initial dose can be followed by a **CONT INF** max 200 mg/kg/day.

### >> (Calcium gluconate):

**Adults: IV** 2-3 g slowly, max 5 ml/min (47.5 mg/min of calcium ion). **For tetany**, give over 5-10 min, repeat q6hr, as needed, as determined by serum calcium concentrations, max 15 g/day or **IV INF** 15 mg/kg of elemental calcium (167 mg/kg) over 4-6 hr may be administered if symptoms recur after initial IV calcium replacement

**Child/infant:** IV 200-500 mg/kg/day **CONT INF** or given in 4 divided doses, at max rate 5 ml/min (47.5 mg/min of calcium ion); **for tetany**, IV 100-200 mg/kg over 5-10 min, may repeat after 6 hr or followed by 500 mg/kg/day IV as a **CONT INF** or in 3-4 divided doses.
**Neonate:** IV 200-800 mg/kg/day as a **CONT INF** or given in 3-4 divided doses. **For tetany,** 100-200 mg/kg IV is recommended, followed by 500 mg/kg/day **CONT INF** or given in 3-4 divided doses.

### >> PO (calcium citrate):

**Adults:** PO 9.5-19 g/day in divided doses 2-4 times a day after meals

### >> PO (calcium gluconate):

**Adults:** PO 22.5-45 g/day in 3-4 divided doses
**Child/infant:** PO 500-725 mg/kg/day in 4 divided doses
**Neonate:** PO 500-1500 mg/kg/day in 4-6 divided doses

### >> IV (calcium chloride 10%):

**Adult:** **IV** 5-10 ml of a 10% solution (500-1000 mg) or 8-16 mg/kg given by slow IV inj; may repeat

### >> IV (calcium gluconate):

**Adult:** **IV** 500-800 mg of 10% solution (5-8 ml) max 3 g
**Infant/child:** IV 60-100 mg/kg or intraosseous (0.6-1 ml/kg) max 3 g

### >> For nutritional supplementation:

PO (any oral calcium salt; dosage expressed as elemental calcium):
**Adults ≥ 51 yrs:** PO 1200 mg per day (range 1000-1500 mg/day)
**Adults 19-50 yrs:** PO 1000 mg per day
**Children/adolescents 9-18 years of age:** PO 1300 mg per day
**Children 4-8 years of age:** PO 800 mg per day
**Children 1-3 years of age:** PO 500 mg per day
**Infants 6-12 months of age:** PO 270 mg per day based on total intake (consumption from breast milk/infant formula and solid food)
**Neonate/infant <6 months of age:** PO 210 mg per day based on total intake (content in human milk/infant formula). Source of calcium intake should come from food/breast milk only in order to prevent high levels of intake.

## Therapeutic Drug Monitoring:

Ionized calcium concentrations are the preferred measure to determine true hypocalcemia. If total serum calcium concentrations are obtained, calcium concentrations should be adjusted if hypoalbuminemia or hyperalbuminemia is present. The corrected calcium concentration may be estimated from the following formula:

$$\text{Corrected calcium (mg/dl)} = \text{serum calcium (mg/dl)} + 0.8\,[4 - \text{serum albumin (g/dl)}]$$

**Available forms:** Many; check product listings
Calcium chloride: Injection 10% solution (ampules, syringes, vials 10 ml)
Calcium citrate: Caps 150 mg; tabs 200, 250, 950, 1040 mg; granules 760 mg/3.5g
Calcium glubionate: Syrup 1.8 g/5 ml Calcium gluconate: Tabs 500-650, 975, 1 g; injection 10%

## Implementation

**PO route**
- Give PO with or following meals to enhance absorption
- Store at room temperature

**IM route**
- Can cause severe tissue necrosis, do not use IM
- Do not give chloride, gluconate IM

**IV route**
- Warm to room temperature, administer **IV** undiluted or diluted with equal amounts of 0.9% NaCl for inj to a 5% sol; give 0.5-1 ml/min, give slowly, rapid administration may cause cardiac arrest
- Give through small-bore needle into large vein; do not use scalp vein if extravasation occurs, necrosis will result (**IV**); IM inj may cause severe burning, necrosis, and tissue sloughing; warm sol to body temp before administering (only gluconate/gluceptate)
- Provide seizure precautions: padded side rails, decreased stimuli (noise, light); place airway suction equipment, padded mouth gag if calcium levels are low
- Patient should remain recumbent 30 min after IV dose, drop in B/P may result

### >> Calcium chloride

**Y-site compatibility:** Acyclovir, alemtuzumab, alfentanil, amikacin, aminocaproic acid, aminophylline, amiodarone, anidulafungin, argatroban, arsenic trioxide, ascorbic acid injection, asparaginase, atenolol, atracurium, atropine, azithromycin, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium gluconate, CARBOplatin, carmustine, caspofungin acetate, cefotaxime, cefoTEtan, cefOXitin, ceftaroline, ceftizoxime, chloramphenicol, chlorothiazide, chlorpheniramine, chlorproMAZINE, cimetidine,

CISplatin, clindamycin, cloxacillin, colistimethate, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, DAUNOrubicin, dexmedetomidine, dexrazoxane, digoxin, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doxacurium, doxapram, DOXOrubicin, doxycycline, edetate calcium disodium, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, epoetin alfa, eptifibatide, ergonovine, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, furosemide, gallamine, gallium, ganciclovir, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin sodium, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, inamrinone, insulin, regular, irinotecan, isoproterenol, kanamycin, labetalol, lactated Ringer's, lepirudin, leucovorin, lidocaine, lincomycin, linezolid, LORazepam, mannitol, mechlorethamine, meperidine, mephentermine, mesna, metaraminol, methohexital, methotrexate, methyldopate, metoclopramide, metoprolol, metroNIDAZOLE, micafungin, midazolam, milrinone, minocycline, mitoMYcin, mitoXANtrone, mivacurium, morphine, moxifloxacin, multiple vitamins injection, mycophenolate mofetil, nafcillin, nalbuphine, nalorphine, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxytocin, PACLitaxel (solvent/surfactant), pancuronium, papaverine, penicillin G potassium/sodium, pentazocine, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, phytonadione, piperacillin-tazobactam, polymyxin B, potassium, potassium chloride, procainamide, prochlorperazine, promazine, promethazine, propranolol, protamine, pyridoxine, quinupristin-dalfopristin, raNITIdine, Ringer's injection, rocuronium, streptomycin, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin-clavulanate, tigecycline, tirofiban, TNA (3-in-1), tobramycin, tolazoline, topotecan, trimetaphan, tubocurarine, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, voriconazole

**Calcium gluconate Y-site compatibilities:** Acyclovir, aldesleukin, alemtuzumab, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amiodarone, anidulafungin, argatroban, arsenic trioxide, ascorbic acid injection, asparaginase, atenolol, atracurium, atropine, azaTHIOprine, azithromycin, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride, CARBOplatin, carmustine, caspofungin, cefamandole, ceFAZolin, cefepime, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, ceftaroline, cefTAZidime, ceftizoxime, cefuroxime, chloramphenicol sodium succinate, chlorothiazide, chlorpheniramine, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, cladribine, clindamycin, cloxacillin, codeine, colistimethate, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, DAUNOrubicin, DAUNOrubicin liposome, dexmedetomidine, dexrazoxane, digoxin, dilTIAZem, dimenhyDRINATE, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doripenem, doxacurium, doxapram, DOXOrubicin, DOXOrubicin liposomal, doxycycline, edetate calcium disodium, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, epoetin alfa, eptifibatide, ergonovine, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, filgrastim, fludarabine, fluorouracil, folic acid (as sodium salt), furosemide, gallamine, gallium, ganciclovir, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin sodium, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, insulin, regular, irinotecan, isoproterenol, kanamycin, ketamine, labetalol, lactated Ringer's injection, lepirudin, leucovorin, levofloxacin, lidocaine, lincomycin, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, mephentermine, mesna, metaraminol, methohexital, methotrexate, methyldopate, metoclopramide, metoprolol, metroNIDAZOLE, micafungin, midazolam, milrinone, mitoMYcin, mitoXANtrone, mivacurium, morphine, moxifloxacin, multiple vitamins injection, nafcillin, nalbuphine, nalorphine, naloxone, nesiritide, netilmicin, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oritavancin, oxaliplatin, oxytocin, PACLitaxel (solvent/surfactant), palonosetron, pancuronium, papaverine, penicillin G potassium/sodium, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, phytonadione, polymyxin B, potassium acetate/chloride, procainamide, prochlorperazine, promazine, promethazine, propofol, propranolol, protamine, pyridoxine, quiNIDine, raNITIdine, remifentanil, Ringer's, riTUXimab, rocuronium, sargramostim, sodium acetate, streptomycin, succinylcholine, SUFentanil, tacrolimus, telavancin, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA (3-in-1), tobramycin, tolazoline, TPN (2-in-1), trastuzumab, trimethaphan, tubocurarine, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, vitamin B complex with C, voriconazole

## ADVERSE EFFECTS

**CV:** Shortened QT interval, heart block, hypotension, bradycardia, dysrhythmias; cardiac arrest (IV)
**GI:** Vomiting, nausea, constipation
**HYPERCALCEMIA:** Drowsiness, lethargy, muscle weakness, headache, constipation, coma, anorexia, nausea, vomiting, polyuria, thirst
**INTEG:** Pain, burning at **IV** site, severe venous thrombosis, necrosis, extravasation

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete bioavailability (**IV**) |
| **Distribution** | Readily extracellular; crosses placenta, protein binding 40%-50% |
| **Metabolism** | Liver |
| **Excretion** | Feces (80%), kidney (20%), breast milk |
| **Half-life** | Unknown |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | Unknown | Immediate |
| **Peak** | Unknown | Rapid |
| **Duration** | Unknown | ½-1½ hr |

## INTERACTIONS

### Individual drugs

Atenolol: decreased effect
Phenytoin, tetracyclines, thyroid: decreased absorption when calcium is taken PO
DilTIAZem, verapamil: decreased effects, increased toxicity

### Drug classifications

Antacids: milk-alkali syndrome (renal disease)
Digoxin glycosides: increased dysrhythmias
Diuretics (thiazide): increased hypercalcemia
Fluoroquinolones: decreased absorption of fluoroquinolones when calcium is taken PO
Iron salts: decreased absorption of iron when calcium is taken PO

### Drug/herb

Lily of the valley, pheasant's eye, shark cartilage, squill: increased side effects, action

### Drug/lab test

Increased: calcium

## NURSING CONSIDERATIONS

### Assessment

- **Monitor ECG for decreased QT interval and T-wave inversion during rapid administration:** in hypercalcemia, product should be reduced or discontinued
- Monitor calcium levels during treatment (9-10 mg/dl is normal level), urine calcium if hypercalciuria occurs
- Assess cardiac status: rate, rhythm, CVP (PWP, PAWP if being monitored directly)
- Assess digitalized patients closely, an increase in calcium increases digoxin toxicity risk
- **Hypocalcemia:** muscle twitching, paresthesia, dysrhythmias, laryngospasm
- **Pregnancy/breastfeeding:** Use only if clearly needed, no well-controlled studies, considered to be compatible with breastfeeding

### Patient/family education

- Caution patient to add food high in vit D content; to add calcium-rich foods to diet: dairy products, shellfish, dark green leafy vegetables; decrease oxalate-rich and zinc-rich foods: nuts, legumes, chocolate, spinach, soy
- Advise patient to prevent injuries, avoid immobilization

### Evaluation

**Positive therapeutic outcome**

- Decreased twitching, paresthesias, muscle spasms
- Absence of tremors, seizures, dysrhythmias, dyspnea, laryngospasm, negative Chvostek's sign, negative Trousseau's sign

## canagliflozin

(kan'a-gli-floe'zin)
**Invokana**
*Func. class.:* Oral antidiabetic
*Chem. class.:* Sodium otocose cotransporter 2, SGLT-2 inhibitor

**ACTION:** Blocks reabsorption by the kidney, increases glucose excretion, lowers blood glucose concentrations

**Therapeutic outcome:** Improved signs/symptoms of diabetes mellitus (decreased polyuria, polydipsia, polyphagia; clear sensorium; absence of dizziness; stable gait

**USES:** Type 2 diabetes mellitus, with diet and exercise, may use in combination

## CONTRAINDICATIONS

Dialysis, renal failure, hypersensitivity, breastfeeding, diabetic ketoacidosis

**Precautions:** Pregnancy, children, renal/hepatic disease, hypothyroidism, hyperglycemia, hypotension, pituitary insufficiency, type 1 diabetes mellitus, malnutrition, fever, dehydration, adrenal insufficiency, geriatrics

## DOSAGE AND ROUTES

### Renal dose

**Adult:** PO eGFR 45-59 ml/min/1.73 $m^2$, max 100 mg/day; <45 ml/min/1.73 $m^2$, do not use

**Available forms:** Tabs 100, 300 mg

### Implementation

**PO route**

- Once daily with first meal of the day
- Adjust dose in times of stress, surgery, trauma
- Store at room temperature

## ADVERSE EFFECTS

**CNS:** Dizziness, fatigue
**GI:** Abdominal pain, pancreatitis, constipation, nausea
**GU:** Candidiasis, urinary frequency, polydipsia, polyuria, renal impairment
**INTEG:** Photosensitivity, rash, pruritus
**META:** Hypercholesterolemia, lipidemia, hypoglycemia, hyperkalemia, hypermagnesemia, hyperphosphatemia, hypersensitivity
**MISC:** Bone fractures
**CV:** Hypotension, orthostatic hypotension

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 99% protein binding |
| **Metabolism** | By UGT1A9, UGT2B4 |
| **Excretion** | 33% in urine |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Baclofen, cycloSPORINE, estrogen, isoniazid, tacrolimus: decreased effect, hyperglycemia
Gatifloxacin: do not use concurrently
Lithium: increased or decreased glycemic control
Increase: Hyperkalemia, potassium-sparing diuretics

### Drug classifications

ACE inhibitors, angiotensin II receptor antagonists, β-blockers, bile acid sequestrants, fibric acid derivatives, insulin, MAOIs, salicylates, sulfonylureas: increased hypoglycemia, monitor for hypoglycemia
Atypical antipsychotics, carbonic anhydrase inhibitors, corticosteroids, digestive enzymes, intestinal absorbents, loop diuretics, oral contraceptives, phenothiazines, progestins, protease inhibitors, sympathomimetics, thiazide diuretics: decreased effect, hyperglycemia

### Drug/lab tests

Increase: Magnesium, phosphate, uric acid, serum creatinine
Decrease: Serum glucose, eGFR
UGT inducers PHENobarbital, ritonavir; dose may need to be increased

## NURSING CONSIDERATIONS

### Assessment

- Assess for hypoglycemia (weakness, hunger, dizziness, tremors, anxiety, tachycardia, sweating), hyperglycemia; even though product does not cause hypoglycemia, if patient is on sulfonylureas or insulin, hypoglycemia may be additive; if hypoglycemia occurs, treat with dextrose, or, if severe, with IV glucagon
- Monitor for stress, surgery, or other trauma that may require a change in dose
- A1c q3mo, monitor serum glucose; 1 hr PP throughout treatment; serum cholesterol, serum creatinine/BUN, serum electrolytes
- **Bone fractures:** Monitor bone density, other conditions that may lead to bone fractures, fractures may occur within 3 mo of starting therapy
- **Renal impairment:** Monitor those with renal disease more frequently, increased creatinine, BUN may occur
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, or if breastfeeding

### Patient/family education

- Teach patient the symptoms of hypoglycemia/hyperglycemia, what to do about each
- Instruct patient that medication must be taken as prescribed; explain consequences of discontinuing medication abruptly; that insulin may need to be used for stress, including trauma, fever, surgery, to take as soon as remembered if dose is missed unless close to next dose, then skip and take at next dose, do not take double dose
- Instruct patient to avoid OTC medications and herbal supplements unless approved by health care provider
- Instruct patient that diabetes is a lifelong illness; that the diet and exercise regimen must be followed; that this product is not a cure
- Instruct patient to carry emergency ID and glucose source; to avoid sugar, because sugar is blocked by acarbose
- Teach patient that blood glucose monitoring is required to assess product effect
- Teach patient that GI side effects may occur

• **Yeast infections (women/men):** Advise women that yeast infections can occur with this product, women (vaginal), men (penile), to report discharge, itching, swelling
• **Pregnancy/breastfeeding:** Not to breastfeed, to advise prescriber if pregnancy is planned or suspected
• **Ketoacidosis:** Advise patient to notify prescriber immediately of nausea, vomiting
• Lack of appetite, sleepiness, difficulty breathing

### Evaluation
**Therapeutic response:** improved signs/symptoms of diabetes mellitus (decreased polyuria, polydipsia, polyphagia; clear sensorium, absence of dizziness, stable gait

## candesartan (Rx)
(can-deh-sar′tan)
**Atacand**
*Func. class.:* Antihypertensive
*Chem. class.:* Angiotensin II receptor (type $AT_1$)

**Do not confuse:** Atacand/antacid

**ACTION:** Blocks the vasoconstrictor and aldosterone-secreting effects of angiotensin II; selectively blocks the binding of angiotensin II to the $AT_1$ receptor found in tissues

**Therapeutic outcome:** Decreased B/P, decreased heart failure–related complications or death

**USES:** Hypertension, alone or in combination; HF NYHA Class II-IV and ejection fraction ≤40%

## CONTRAINDICATIONS
Hypersensitivity

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Pregnancy (1st trimester), breastfeeding, children, geriatric, hypersensitivity to ACE inhibitors, volume depletion, renal/hepatic impairment, renal artery stenosis, hypotension, electrolyte abnormalities

## DOSAGE AND ROUTES
**Adult:** PO (single agent) 16 mg daily initially in patients who are not volume depleted, range 8-32 mg/day; with diuretic or volume depletion, 8-32 mg/day as a single dose or divided bid
**Adult and child ≥6 yr and weight >50 kg:** PO 8-16 mg/day or divided bid, adjust to B/P, usual range 4-32 mg/day max 32 mg/day
**Child ≥6 yr and weight <50 kg:** PO 4-8 mg/day or divided bid, adjust to B/P
**Child ≥1 yr and <6 yr:** PO 0.2 mg/kg/day in 1 dose or divided in 2 doses/day, adjust B/P, max 0.4 mg/kg/day, max 16 mg/day

### Heart failure
**Adult:** PO 4 mg/day, may be doubled ≥2 wk, target dose 32 mg/day

### Renal/hepatic dose
**Adult:** PO ≤8 mg/day in severe renal disease/moderate hepatic disease, adjust dose as needed

**Available forms:** Tabs 4, 8, 16, 32 mg

### Implementation
• Administer without regard to meals
• Oral liquid (compounded) shake well, do not freeze

## ADVERSE EFFECTS
**CNS:** *Dizziness,* fatigue, headache, syncope
**CV:** Chest pain, peripheral edema, hypotension, palpitations
**EENT:** Sinusitis, rhinitis, pharyngitis
**GI:** *Diarrhea,* nausea, abdominal pain, vomiting
**GU:** Renal failure
**MS:** Arthralgia, pain
**RESP:** *Cough, upper respiratory infection*
**SYST:** Angioedema, hypersensitivity reactions

### Pharmacokinetics
| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Bound to plasma proteins |
| **Metabolism** | Extensive |
| **Excretion** | Feces, urine, breast milk |
| **Half-life** | 9 hr |

### Pharmacodynamics
| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2 hr |
| **Duration** | 24 hr |

## INTERACTIONS
### Individual drugs
Lithium: increased lithium level
Potassium: increased hyperkalemia, ACE inhibitors

### Drug classifications
α-Blockers, ACE inhibitors, β-blockers, calcium channel blockers, MAOIs: increased hypotension
Diuretics (potassium sparing): increased hypokalemia
NSAIDs, salicylates: decreased effect

### Drug/herb
Astragalus, cola tree: increased or decreased antihypertensive effect
Ephedra: decreased antihypertensive effect
Hawthorn: increased antihypertensive effect

### Drug/Lab
Increase: albumin, ALT/AST, potassium

## NURSING CONSIDERATIONS
### Assessment
**Hypertension:**
- **Serious hypersensitivity reactions:** Assess for angioedema, anaphylaxis; facial swelling, difficulty breathing (rare)
- **Heart failure:** Monitor for jugular vein distention, weight, edema, dyspnea, crackles
- Assess B/P, pulse q4hr; note rate, rhythm, quality, notify prescriber of significant changes
- Monitor electrolytes: potassium, sodium, chloride; total $CO_2$, hyperkalemia is more common with other diuretics
- Obtain baselines in renal, liver function tests before therapy begins
- Assess blood studies: BUN, creatinine, liver function tests before treatment
- Monitor for edema in feet, legs daily
- Assess for skin turgor, dryness of mucous membranes for hydration status; for angioedema: facial swelling, dyspnea

**BLACK BOX WARNING:** Assess for pregnancy; pregnancy/breastfeeding: this product can cause fetal death when given in pregnancy, breastfeeding

- Assess for adverse reactions, especially in renal disease

### Patient/family education
- Teach patient not to take the product if breastfeeding or pregnant, or having had an allergic reaction to this product
- If a dose is missed, instruct patient to take as soon as possible, unless it is within 1 hour before next dose
- **Pregnancy/breastfeeding:** Advise patient to inform prescriber if pregnancy is planned or suspected, or if breastfeeding
- **Bleeding:** Advise patient to report bleeding immediately (blood in urine, gums, bruising, feeling faint)
- **Hypersensitivity:** Advise patient to report immediately difficulty breathing, hives, swelling of face, lips
- Advise patient to comply with dosage schedule, even if feeling better
- Teach patient to notify prescriber of fever, swelling of hands or feet, irregular heartbeat, chest pain
- Advise patient that excessive perspiration, dehydration, diarrhea may lead to fall in blood pressure—consult prescriber if these occur
- Inform patient that product may cause dizziness, fainting; light-headedness may occur
- Advise patient to avoid all OTC medications unless approved by prescriber; to inform all health care providers of medication use, full effect 4 wk, onset 2 wk, that product may be taken with or without meals, to store at room temperature
- Caution patient to rise slowly to sitting or standing position to minimize orthostatic hypotension
- Teach proper technique for obtaining B/P and acceptable parameters

**BLACK BOX WARNING:** Teach patient to notify prescriber immediately if pregnant, not to use if breastfeeding

### Evaluation
**Positive therapeutic outcome**
- Decreased B/P, decreased heart failure–related complications, death

**⚠ HIGH ALERT**

## capecitabine (Rx)
(cap-eh-sit'ah-bean)
**Xeloda**
*Func. class.:* Antineoplastic, antimetabolite
*Chem. class.:* Fluoropyrimidine carbamate

**Do not confuse:** Xeloda/Xenical

**ACTION:** Competes with physiologic substrate of DNA synthesis, thus interfering with cell replication in the S phase of cell cycle (before mitosis); also interferes with RNA and protein synthesis; product is converted to 5-fluorouracil (5-FU)

**Therapeutic outcome:** Decreasing symptoms of breast cancer

**USES:** PACLitaxel and anthracycline metastatic breast, colorectal cancer when 5-FU monotherapy is preferred; treatment of patients with colorectal cancer who have undergone complete resection of their primary tumor

## CONTRAINDICATIONS
Pregnancy, infants, hypersensitivity to 5-FU, severe renal impairment (CCr <30 ml/min), DPD deficiency

**Precautions:** Renal/hepatic/cardiac disease, breastfeeding, children, geriatric patients, radiation therapy, DPD deficiency

**BLACK BOX WARNING:** Anticoagulant therapy

## DOSAGE AND ROUTES
**Metastatic breast cancer resistant to both PACLitaxel and anthracycline or resistant to PACLitaxel and when further anthracycline therapy is not indicated**

**Adult:** PO 2500 mg/m²/day divided q12hr after meal ×2 wk, repeat q3wk

### Breast cancer (locally advanced/metastatic) with DOCEtaxel, previously treated with anthracycline

**Adult:** PO 2500 mg/m²/day divided q12hr after a meal on days 1-14, with DOCEtaxel 75 mg/m² IV on day 1

### Advanced/metastatic breast cancer (HER2 positive), who have received anthracycline, taxane, and trastuzumab

**Adult:** PO 2000 mg/m²/day divided q12hr after a meal on days 1-14 with lapatinib 1250 mg/day on days 1-21, repeat q21days

### Metastatic/locally advanced breast cancer, resistant to anthracycline, and a taxane or taxane resistant and when further anthracycline is contraindicated

**Adult:** PO 2000 mg/m²/day divided q12hr on days 1-14 with ixabepilone 40 mg/m² IV over 3 hr, repeat q3wk

### As an adjuvant in Dukes C colorectal cancer with a complete resection when fluoropyrimidine alone is preferred

**Adult:** PO 2500 mg/m²/day divided q12hr within 30 min of a meal ×2 wk, repeat q3wk for 8 cycles

### First-line in metastatic colorectal cancer when fluoropyrimidine alone is preferred

**Adult:** PO 2500 mg/m²/day divided q12hr after a meal ×2 wk repeat q3wk

### Renal dose

**Adult:** PO CCr 30-50 ml/min; decrease initial dose to 75% of usual dose; CCr < 30 ml/min contraindicated

**Available forms:** Tabs 150, 500 mg

### Implementation

- **Dosage adjustments of capecitabine monotherapy based on the most severe toxicity OR when used in combination with ixabepilone based on nonhematologic toxicity:** *Grade 1 toxicity:* Maintain current dosage; *Grade 2 toxicity (1st appearance):* interrupt therapy until toxicity is resolved to grade 0–1; do not replace missed doses, begin the next cycle with 100% of the starting dose; *Grade 2 toxicity (2nd appearance):* interrupt therapy until toxicity is resolved to grade 0–1; do not replace missed doses, begin the next cycle with 75% of the starting dose; *Grade 2 toxicity (3rd appearance):* interrupt therapy until toxicity is resolved to grade 0–1; do not replace missed doses, begin the next cycle with 50% of the starting dose; *Grade 2 toxicity (4th appearance):* discontinue treatment permanently; *Grade 3 toxicity (1st appearance):* interrupt therapy until toxicity is resolved to grade 0-1
- Help patient to rinse mouth tid-qid with water or club soda, brush teeth bid-qid with soft brush or cotton-tipped applicators for stomatitis, use unwaxed dental floss

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, *paresthesia, fatigue,* insomnia
**CV:** Venous thrombosis
**GI:** *Nausea, vomiting, anorexia, diarrhea, stomatitis, abdominal pain, constipation, dyspepsia*, intestinal obstruction, necrotizing enterocolitis, hyperbilirubinemia, hepatic failure, GI bleeding
**HEMA:** Neutropenia, lymphopenia, thrombocytopenia, anemia
**INTEG:** *Hand and foot syndrome,* dermatitis, nail disorder, alopecia, rash
**MISC:** Eye irritation, edema, myalgia, limb pain, *pyrexia,* dehydration, renal impairment
**RESP:** *Cough, dyspnea,* pulmonary embolism

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Readily absorbed, decreased with food |
| **Distribution** | Unknown |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys |
| **Half-life** | 45 min |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1½ hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Leucovorin: increased toxicity, monitor for toxicity
Phenytoin: increased phenytoin level, monitor phenytoin level

### Drug classifications

Antacids (aluminum, magnesium): increased capecitabine

**BLACK BOX WARNING:** Anticoagulants: increased risk of bleeding, NSAIDs, salicylates, platelet inhibitors, thrombolytics; monitor PT and INR

### Food/drug

Increased absorption; give within 30 min of a meal

### Drug/lab test

Increased: bilirubin
Decreased: Hgb/Hct/RBC, neutrophils, platelets, WBC

## NURSING CONSIDERATIONS

### Assessment

- **Bone marrow suppression:** Monitor CBC, differential, platelet count weekly; withhold product if WBC $<1000/mm^3$ or platelet count is $<50,000/mm^3$ or RBC, Hct, Hgb is low; notify prescriber of results; frequently monitor INR in those receiving warfarin
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected or if breastfeeding, women should use contraception while taking this product, discontinue breastfeeding or discontinue product
- Assess buccal cavity q8hr for dryness, sores or ulceration, white patches, pain, bleeding, dysphagia; obtain prescription for viscous lidocaine (Xylocaine)
- Assess symptoms indicating severe allergic reaction: rash, pruritus, urticaria, purpuric skin lesions, itching, flushing; product should be discontinued
- Monitor temp q4hr (may indicate beginning of infection)
- **Assess for hand/foot syndrome:** paresthesia, tingling, painful/painless swelling, blistering, erythema with severe pain of hands/feet
- **Assess for toxicity:** severe diarrhea (multiple times/day or at night), nausea, vomiting, stomatitis, adjust dose, stop treatment if severe
- Assess **GI symptoms:** frequency of stools, cramping; if severe diarrhea occurs, fluids/electrolytes may need to be given, those who are elderly are at greater risk of GI symptoms
- Monitor liver function tests before and during therapy (bilirubin, AST, ALT, LDH) as needed or monthly; note jaundice of skin or sclera, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea

**BLACK BOX WARNING:** Assess for bleeding: hematuria, stool guaiac, bruising or petechiae, mucosa or orifices q8hr; inflammation of mucosa, breaks in skin, monitor INR and PT in those taking anticoagulants, adjustment of dose may be needed

### Patient/family education

- Advise patient to avoid use of products containing aspirin or ibuprofen, razors, commercial mouthwash, since bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools)
- Instruct patient to report signs of **anemia** (fatigue, headache, irritability, faintness, shortness of breath); **infection:** increased temp, sore throat, flulike symptoms
- Advise patient not to become pregnant while taking this product, pregnancy; not to use while breastfeeding, use adequate contraception
- Advise patient not to double dose, if dose is missed, how to take (on for 14 days then 7 days off) then start new cycle; do not crush, cut, to take with water
- Advise patient to report immediately severe diarrhea, vomiting, stomatitis, fever $\geq 100°$ F, hand/foot syndrome, anorexia, stop taking this product
- Advise patient to avoid foods with citric acid, hot or rough texture if stomatitis is present; take with water within 30 min at end of meal

### Evaluation

**Positive therapeutic outcome**

- Prevention of rapid division of malignant cells

## captopril (Rx)

(kap′toe-pril)
**Apo-Capto, Capoten**
*Func. class.:* Antihypertensive
*Chem. class.:* Angiotensin-converting enzyme (ACE) inhibitor

**Do not confuse:** captopril/carvedilol

**ACTION:** Selectively suppresses renin-angiotensin-aldosterone system; inhibits ACE; prevents conversion of angiotensin I to angiotensin II

**Therapeutic outcome:** Decreased B/P in hypertension; decreased preload, afterload in HF

**USES:** Hypertension, HF, left ventricular dysfunction (LVD) after MI, diabetic nephropathy, proteinuria

## CONTRAINDICATIONS

Breastfeeding, children, hypersensitivity, heart block, potassium-sparing diuretics, bilateral renal artery stenosis, ACE inhibitors, ACE inhibitor–induced angioedema

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Dialysis patients, hypovolemia, leukemia, scleroderma, LE, blood dyscrasias, HF, diabetes mellitus, renal/hepatic disease, thyroid disease, African descent, pregnancy 1st trimester, collagen-vascular disease, hyperkalemia, hyponatremia

C

## DOSAGE AND ROUTES

### Hypertension

**Adult:** Initial dose: PO 12.5-25 mg bid-tid; may increase to 50 mg bid-tid at 1-2 wk intervals; usual range 25-150 mg bid-tid; max 450 mg/day
**Child:** PO 0.3-0.5 mg/kg/dose, may titrate up to 6 mg/kg/day in 2-4 divided doses

**Neonate:** PO 0.05-0.1 mg/kg bid-tid, may increase as needed

### HF

**Adult:** PO 25 mg tid; may increase to 50 mg bid-tid; after 14 days may increase to 150 mg tid if needed

### Diabetic nephropathy

**Adult:** PO 25 mg tid

### Renal dose

**Adult:** PO CCr >50 ml/min, no change; CCr 10-50 ml/min, decrease dose by 25%; CCr <10 ml/min, decrease dose by 50%

**Available forms:** Tabs 12.5, 25, 50, 100 mg

### Implementation

- Store in air-tight container at 86° F (30° C) or less
- Severe hypotension may occur after first dose of this medication; decreasing hypotension may be prevented by reducing or discontinuing diuretic therapy 3 days before beginning captopril therapy
- Administer 1 hr before or 2 hr after meals
- **Oral sol:** May crush tab and dissolve in water, give within ½ hr, make sure tab is completely dissolved

## ADVERSE EFFECTS

**CNS:** Fever, chills
**CV:** *Hypotension,* postural hypotension, *tachycardia,* angina
**GI:** Loss of taste, increased liver function tests
**GU:** Impotence, dysuria, nocturia, proteinuria, nephrotic syndrome, acute reversible renal failure, polyuria, oliguria, frequency
**HEMA:** Neutropenia, agranulocytosis, pancytopenia, thrombocytopenia, anemia
**INTEG:** Rash, pruritus
**MISC:** Angioedema, hyperkalemia
**RESP:** Bronchospasm, *dyspnea, cough*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed; crosses placenta, excreted in breast milk (small amounts) |
| **Metabolism** | Liver (50%) |
| **Excretion** | Kidneys, unchanged (50%) |
| **Half-life** | 2 hr increase in renal disease |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ¼-1 hr |
| **Peak** | 1 hr |
| **Duration** | 6-12 hr |

## INTERACTIONS

### Individual drugs

Alcohol (acute ingestion): increased hypotension (large amounts)
Digoxin, lithium: increased serum levels, toxicity, monitor blood glucose
Insulin: increased hypoglycemia, monitor individual drug levels

### Drug classifications

Antacids, NSAIDs, salicylates: decreased captopril effect
Antidiabetics (oral): increased hypoglycemia
Antihypertensives, diuretics, nitrates, phenothiazines: increased hypotension
Diuretics (potassium-sparing), potassium supplements: increased toxicity, do not use
Sympathomimetics: do not use

### Drug/herb

Ephedra: decreased antihypertensive effect
Hawthorn: increased antihypertensive effect

### Drug/food

Food: decreased absorption of captopril

### Drug/lab test

Increased: AST, ALT, alkaline phosphatase, bilirubin, uric acid, potassium
Decreased: platelets, WBC, RBC, Hgb/Hct
False positive: urine acetone, ANA titer

## NURSING CONSIDERATIONS

### Assessment

- **Blood dyscrasias:** Monitor blood studies: decreased platelets; WBC with diff baseline q2wk × 3 mo and periodically during 1 yr, periodically q3mo, if neutrophils are <1000/mm$^3$, discontinue treatment
- **Hypertension:** Monitor B/P, check for orthostatic hypotension, syncope; if changes occur, dosage change may be required; notify prescriber of significant changes
- **Heart failure:** Monitor for dyspnea, jugular venous distention, weight gain, edema, rales/crackles in lungs
- Monitor renal studies: protein, BUN, creatinine; watch for increased levels that may indicate nephrotic syndrome and renal failure; monitor renal symptoms: polyuria, oliguria, frequency, dysuria, potassium
- Establish baselines in renal, liver function tests before therapy begins and check periodically; monitor for increased liver function studies; watch for increased uric acid, glucose

• Check potassium levels throughout treatment, although hyperkalemia rarely occurs
• **HF:** Assess for edema, dyspnea, wet crackles, increased B/P, weight gain

**BLACK BOX WARNING: Pregnancy:** discontinue ACE inhibitors when pregnancy is detected, monitor fetal development regularly

• **Angioedema:** Assess for allergic reactions: rash, fever, pruritus, urticaria; product should be discontinued if antihistamines fail to help; swelling of lips, mouth, face, difficulty breathing/swallowing (angioedema), provide supportive care, discontinue product

### Patient/family education

• Caution patient not to discontinue product abruptly; advise patient to tell all persons associated with care
• Teach patient not to use OTC products (cough, cold, allergy) unless directed by prescriber; serious side effects can occur; xanthines such as coffee, tea, chocolate, cola can prevent action of product
• Teach patient importance of complying with dosage schedule, even if feeling better; to continue with medical regimen to decrease B/P: exercise, smoking cessation, decreasing stress, diet modifications
• Emphasize the need to rise slowly to sitting or standing position to minimize orthostatic hypotension; not to exercise in hot weather or increased hypotension can occur
• Teach patient to notify prescriber of mouth sores, sore throat, fever, swelling of hands or feet, irregular heartbeat, chest pain, coughing, shortness of breath
• Caution patient to report excessive perspiration, dehydration, vomiting, diarrhea; may lead to fall in B/P
• Caution patient that product may cause dizziness, fainting, light-headedness; may occur during first few days of therapy; to avoid activities that may be hazardous, avoid activities that require concentration
• Teach patient how to take B/P, and teach normal readings for age-group; ensure patient takes regularly

**BLACK BOX WARNING:** Advise patient to tell prescriber if pregnancy is suspected or planned, breastfeeding; do not breastfeed

### Evaluation

**Positive therapeutic outcome**
• Decreased B/P in hypertension

## TREATMENT OF OVERDOSE:

0.9% NaCl **IV** infusion, hemodialysis

# carbachol ophthalmic

*See Appendix B*

# carBAMazepine (Rx)

(kar-ba-maz′e-peen)
**Carbatrol, Equetro, Mazepine, Novo-Carbamaz, Tegrol-CR, TEGretol, TEGretol-XR, Teril**
*Func. class.:* Anticonvulsant
*Chem. class.:* Iminostilbene derivative

**Do not confuse:** carBAMazepine/OXcarbazepine/TEGretol/Toradol/Tequin/TRENtal

**ACTION:** Exact mechanism unknown; appears to decrease polysynaptic responses and block posttetanic potentiation

**Therapeutic outcome:** Absence of seizures; decreased trigeminal neuralgia pain

**USES:** Tonic-clonic, complex-partial, mixed seizures; trigeminal neuralgia; bipolar disorder (Equetro only); diabetic neuropathy

**Unlabeled uses:** Neurogenic pain, psychotic behavior with dementia, agitation, hiccups

## CONTRAINDICATIONS

Pregnancy, hypersensitivity to carBAMazepine or tricyclics, bone marrow suppression

**Precautions:** Glaucoma, renal/hepatic/cardiac disease, psychosis, breastfeeding, child <6 yr, alcoholism, hepatic porphyria, AV or bundle branch block

**BLACK BOX WARNING:** Hematologic disease, agranulocytosis, leukopenia, neutropenia, thrombocytopenia, Asian patients or those with positive HLA-B 1502 or HLA-A 3lol alleles

## DOSAGE AND ROUTES/NTI

### Seizures

**Adult and child >12 yr:** PO 200 mg bid; may be increased by 200 mg/day in weekly intervals, give in divided doses q6-8hr; maintenance 800-1200 mg/day; max 1600 mg/day (adult); max child 12-15 yr 1000 mg/day; max child >15 yr 1200 mg/day; adjustment is needed to minimum dose to control seizures; EXT REL give bid; RECT administration of oral SUSP 200 mg/10 ml or 6 mg/kg as a single dose
**Child 6-12 yr:** PO tabs 100 mg bid or SUSP 50 mg qid; may increase by <100 mg qwk, max 1000 mg/day, usual dose 15-30 mg/kg/day; EXT REL tabs daily-bid
**Child <6 yr:** PO 10-20 mg/kg/day in 2-3 divided doses or 4 divided doses (susp), may increase qwk, don't use ext rel

### Trigeminal neuralgia

**Adult:** PO 100 mg/bid; may increase 100 mg q12hr until pain subsides; max 1200 mg/day; maintenance is 200-400 mg bid

### Bipolar disorder

**Adult:** PO (Equetro only) (regular release) 200 mg bid, may adjust dose 3-4 days to achieve carBAMazepine level to 8-12 mcg/ml micro response; max 1600 mg/day

**Available forms:** Chewable tabs 100, 200 mg; oral susp 100 mg/5 ml; ext rel tabs 100, 200, 400 mg; ext rel caps (Carbatrol) 200, 300 mg

### Implementation

- Do not break, crush, or chew ext rel tabs and caps: ext rel caps may be opened and beads mixed with food; chewable tabs should be chewed, not swallowed whole
- When converting from tabs to oral susp give same amount/day, or regular release to extended release same amount
- Give with food for GI symptoms
- Shake oral susp before use
- **Suspension:** Turn off N/G, internal feeding 15 min before and hold for 15 min after; mix an equal amount of water, $D_5W$, 0.9% NaCl when giving by NG tube, flush tube with 15-30 ml of above sol
- Store at room temperature

## ADVERSE EFFECTS

**CNS:** *Drowsiness,* dizziness, confusion, fatigue, paralysis, headache, hallucinations, worsening of seizures, unsteadiness, speech disturbances, suicidal ideation, neuroleptic malignant syndrome (when used with psychotropics), tremor
**CV:** Hypertension, HF, hypotension, aggravation of CAD, dysrhythmias, AV block
**EENT:** Tinnitus, dry mouth, blurred vision, diplopia, nystagmus, conjunctivitis
**ENDO:** Syndrome of inappropriate antidiuretic hormone (SIADH) (geriatric)
**GI:** *Nausea, constipation, diarrhea,* anorexia, vomiting, abdominal pain, stomatitis, glossitis, increased liver enzymes, hepatitis, hepatic porphyria, hypercholesterolemia, pancreatitis
**GU:** Frequency, retention, albuminuria, glycosuria, impotence, increased BUN, renal failure
**HEMA:** Thrombocytopenia, leukopenia, agranulocytosis, leukocytosis, aplastic anemia, eosinophilia, increased pro-time, lymphadenopathy
**INTEG:** *Rash,* Stevens-Johnson syndrome, urticaria, photosensitivity, toxic epidermal necrolysis, DRESS, alopecia, pruritus
**MS:** Osteoporosis
**RESP:** Pulmonary hypersensitivity (fever, dyspnea, pneumonitis)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Slow; completely absorbed |
| **Distribution** | Widely distributed; protein binding 76% |
| **Metabolism** | Extensively, liver, metabolized by CYP3A4 |
| **Excretion** | Urine, feces, breast milk |
| **Half-life** | 18-65 hr, then 8-29 hr after first month |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Slow |
| **Peak** | 4-5 hr (PO), 1.5 hr (susp) |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Benzodiazepines, darunavir, delavirdine, doxycycline, felbamate, haloperidol, nefazodone, OXcarbazepine, PHENobarbitol, phenytoin, primidone: decreased effect of these products
Cimetidine, clarithromycin, danazol, dilTIAZem, erythromycin, FLUoxetine, fluvoxaMINE, isoniazid, propoxyphene, valproic acid, verapamil, voriconazole, SSRIs, tricyclics, adjust dose if needed or do not use together increased carBAMazepine levels
CISplatin, darunavir, delavirdine, DOXOrubicin, felbamate, nefazodone, OXcarbazepine, PHENobarbitol, phenytoin, primidone, rifAMPin, theophylline: decreased carBAMazepine levels
Contraceptives (oral): decreased effect of oral contraceptives
Desmopressin, lithium, hypressin, vasopressin: increased effects of each specific product
Doxycycline: decreased effect of doxycycline
Increase: Lithium: increased CNS toxicity, avoid concurrent use
Phenytoin: increased and decreased plasma levels; decreased carBAMazepine plasma levels
Thyroid hormones: decreased effect of thyroid hormones
Warfarin: decreased effect of warfarin, adjust dose as needed

### Drug classifications

CYP3A4 inducers: decreased carBAMazepine levels
CYP3A4 inhibitors: increased carBAMazepine levels, monitor carBAMazepine effectiveness

- **MAOIs:** fatal reaction; do not use together, do not use within 14 days of beginning carBAMazepine
- **Do not use with:** NNRTIs (non-nucleoside reverse-transcriptase inhibitors), nefazodone

### Drug/herb
Echinacea: decreased carBAMazepine metabolism, increased levels
St. John's wort: decreased anticonvulsant action

### Drug/food
Grapefruit juice: increased peak concentration of carBAMazepine, avoid use

### Drug/lab test
Decreased: serum calcium, sodium
Increased: cholesterol

## NURSING CONSIDERATIONS
### Assessment

**BLACK BOX WARNING:** Serious skin reactions: Asian patient, obtain genetic test prior to administration, these patients may develop toxic epidermal necrolysis, Stevens Johnson syndrome, DRESS may be fatal, avoid using

- **Assess for seizures:** assess character, location, duration, intensity, frequency, presence of aura
- Assess for **trigeminal neuralgia:** facial pain including location, duration, intensity, character, activity that stimulates pain
- Monitor liver function tests (AST, ALT) and urine function tests, BUN, urine protein periodically during treatments; serum calcium may be decreased and lead to osteoporosis; cholesterol periodically
- **DRESS:** Assess for fever, lymphadenopathy with multiorgan development, including liver, kidney, cardiac, discontinue carBAMazepine
- **Bone marrow supression:** Assess blood studies: RBC, Hct, Hgb, reticulocyte counts qwk for 4 wk then q3-6mo if on long-term therapy; if myelosuppression occurs, product should be discontinued
- **Beers:** Avoid use in older adults unless safer alternative is not available, ataxia, impaired psychomotor function may occur
- Check blood levels during treatment or when changing dose; therapeutic level 4-12 mcg/ml
- Assess for **blood dyscrasias:** fever, sore throat, bruising, rash, jaundice, epistaxis (long-term treatment only)
- **Assess mental status:** mood, sensorium, affect, behavioral changes, suicidal thoughts/behaviors
- **Toxicity:** Assess for bone marrow suppression, nausea, vomiting, ataxia, diplopia, CV collapse, Stevens-Johnson syndrome
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected or if breastfeeding

### Patient/family education
- Teach patient to carry/wear emergency ID stating patient's name, products taken, condition, prescriber's name, phone number
- Caution patient to avoid driving, other activities that require alertness until stabilized on medication, dizziness, drowsiness occurs
- Teach patient not to discontinue medication quickly after long-term use
- Teach patient to use a nonhormonal type of contraception to prevent harm to the fetus
- Advise patient to use sunscreen to prevent burns
- Teach patient to take exactly as prescribed; do not double or omit doses
- Teach patient to report immediately chills, rash, light-colored stools, dark urine, yellowing of skin/eyes, abdominal pain, sore throat, mouth ulcers, bruising, blurred vision, dizziness, skin rash, fever
- **Pregnancy/breastfeeding:** Teach patient to notify if pregnancy is planned or suspected, avoid breastfeeding, if pregnant, patient should register with American Antiepileptic Drug Pregnancy Registry 888-233-2334
- That ophthalmic exams will be needed, to report changes in vision

### Evaluation
**Positive therapeutic outcome**
- Decreased seizure activity

## TREATMENT OF OVERDOSE:
Lavage, VS

**⚠ HIGH ALERT**

## CARBOplatin (Rx)
(kar'boe'pla-tin)
**Paraplatin** 🍁
*Func. class.:* Antineoplastic alkylating agent
*Chem. class.:* Platinum coordination compound

**Do not confuse:** CARBOplatin/CISplatin

**ACTION:** Produces interstrand DNA cross-links and to a lesser extent DNA-protein cross-links; activity is not cell cycle phase specific

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** Initial treatment of advanced ovarian cancer in combination with other agents; palliative treatment of recurrent ovarian carcinoma after treatment with other antineoplastic agents

## CONTRAINDICATIONS
Pregnancy, hypersensitivity to this product, breastfeeding, significant bleeding, aluminum products used to prepare or administer CARBOplatin

**BLACK BOX WARNING:** Severe bone marrow depression, platinum compound hypersensitivity

**Precautions:** Geriatric patients, radiation therapy within 1 mo, other cancer, chemotherapy within 1 mo, renal disease, liver disease, hearing impairment, infection

**BLACK BOX WARNING:** Anemia, chemotherapy-induced nausea/vomiting, requires a specialized care setting and experienced clinician

## DOSAGE AND ROUTES

### Dosing with the Calvert equation GFR capped at max 12.5 ml/min

**Adult:** The total CARBOplatin dose (in mg) for adults may be calculated using the Calvert equation: *total dose (mg/m$^2$) = target AUC × (GFR + 25)*

**Child:** Calculate CARBOplatin dose (mg/m$^2$) in children as follows: *total dose (mg/m$^2$) = target AUC × [(0.93 × GFR) + 15]*

### Advanced ovarian cancer

**Adult (single agent): IV** INF initially 300 mg/m$^2$ on day 1 with cyclophosphamide, 600 mg/m$^2$ **IV** on day 1, repeat q4wk × 6 cycles; refractory tumors 360 mg/m$^2$ single dose, may repeat q4wk as needed; do not repeat until neutrophils are >2000 mm$^3$ and platelets are >100,000/mm$^3$

### Renal dose

**Adult:** IV INF CCr 41-59 ml/min 250 mg/m$^2$, CCr 16-40 ml/min 200 mg/m$^2$; do not use in CCr <15 ml/min

**Available forms:** Lyophilized powder for inj 50, 150, 450 mg vials; aqueous sol for inj 50 mg/5 ml vial, 150 mg/15 ml vial, 450 mg/45 mg vial, 600 mg/60 ml vial

### Implementation

**BLACK BOX WARNING:** Antiemetic 30-60 min before giving product to prevent vomiting, and prn

**IV route**

- Do not use needles or IV administration sets containing aluminum; may cause precipitate or loss of potency
- Use cytotoxic handling procedures
- **Reconstitute** CARBOplatin 50, 150, or 450 mg with 5, 15, or 45 ml, respectively, of sterile water for inj, $D_5W$, or NaCl (10 mg/ml); then further **dilute** with the same sol to 0.5-4 mg/ml; **give** over 15 min - 1hr **(intermittent INF)**
- **Continuous IV INF** over 24 hr; max dose based on (GFR = 125 mg/ml)
- Store protected from light at room temperature; reconstituted sol is stable for 8 hr at room temperature

**Y-site compatibilities:** Acyclovir, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amiodarone, amphotericin B lipid complex, amphotericin B liposome, ampicillin, ampicillin sulbactam, anidulafungin, atenolol, atracurium, azithromycin, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, caspofungin, ceFAZolin, cefepime, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, cimetidine, ciprofloxacin, cisatracurium, CISplatin, cladribine, clindamycin, codeine, cyclophosphamide, cycloSPORINE, cytarabine, DAPTOmycin, DAUNOrubicin, dexamethasone, dexmedetomidine, dexrazoxane, digoxin, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doripenem, doxacurium, DOXOrubicin, DOXOrubicin liposomal, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, ertapenem, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, fluorouracil, foscarnet, fosphenytoin, furosemide, ganciclovir, gatifloxacin, gemcitabine, gentamicin, granisetron, haloperidol, heparin, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, inamrinone, insulin (regular), irinotecan, isoproterenol, ketorolac, labetalol, levofloxacin, levorphanol, lidocaine, linezolid injection, LORazepam, magnesium sulfate, mannitol, melphalan, meperidine, meropenem, mesna, methohexital, methotrexate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, micafungin, midazolam, milrinone, minocycline, mitoXANtrone, mivacurium, morphine, nafcillin, nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ofloxacin, ondansetron, oxaliplatin, PACLitaxel, palonosetron, pamidronate, pancuronium, pantoprazole, PEMEtrexed, pentamidine, PENTobarbital, PHENobarbital, phentolamine, piperacillin, piperacillin-tazobactam, potassium chloride, potassium phosphates, prochlorperazine, promethazine, propofol, propranolol, raNITIdine, remifentanil, riTUXimab, rocuronium, sargramostim, sodium acetate, sodium bicarbonate, sodium phosphates, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, tacrolimus, teniposide, theophylline, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA, tobramycin, topotecan, TPN, trastuzumab, trimethobenzamide, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, voriconazole, zidovudine

**Solution compatibilities:** $D_5$/0.2% NaCl, $D_5$/0.45% NaCl, $D_5$/0.9% NaCl, 0.9% NaCl, $D_5W$, sterile water for inj

**Solution incompatibilities:** Sodium bicarbonate

## ADVERSE EFFECTS

**CNS:** Seizures, central neurotoxicity, peripheral neuropathy, dizziness, confusion
**CV:** Cardiac abnormalities (fatal CV events), stroke
**EENT:** Tinnitus, hearing loss, vestibular toxicity, visual changes
**GI:** Severe nausea, vomiting, diarrhea, weight loss, mucositis, anorexia, constipation, taste change
**HEMA:** Thrombocytopenia, leukopenia, pancytopenia, neutropenia, anemia, bleeding
**INTEG:** Alopecia, dermatitis, rash, erythema, pruritus, urticaria
**META:** Hypomagnesemia, hypocalcemia, hypokalemia, hyponatremia, hyperuremia
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | Initial 1-2 hr; postdistribution 2½-6 hr; increased in renal disease |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ½ hr |
| **Peak** | Unknown |
| **Duration** | 4-6 hr |

## INTERACTIONS

### Individual drugs

Amphotericin B: increased nephrotoxicity or ototoxicity
Aspirin, anticoagulants, platelet inhibitors: increased risk of bleeding
Phenytoin: decreased levels, monitor levels
Radiation: increased toxicity, bone marrow suppression

### Drug classifications

Aminoglycosides: ototoxicity, increased nephrotoxicity
Antineoplastics, bone marrow–suppressing products: increased bone marrow suppression, monitor blood counts often
Myelosuppressives: increased myelosuppression
NSAIDs: increased risk of bleeding
Thrombolytic agents: increased risk of bleeding

### Drug/lab test

Increased: AST, BUN, alkaline phosphatase, bilirubin, creatinine
Decreased: platelets, neutrophils, WBC, RBC, Hgb/Hct, calcium, potassium, magnesium, phosphate

## NURSING CONSIDERATIONS

### Assessment

Nausea/vomiting: May occur a few hr after administration, antiemetics are used

**BLACK BOX WARNING:** To be used only by person experienced in the use of chemotherapeutic products, in a specialized care setting

**BLACK BOX WARNING: Bone marrow depression:** Monitor CBC, differential, platelet count weekly; withhold product if neutrophil count is $<2000/mm^3$ or platelet count is $<100{,}000/mm^3$; notify prescriber of results, calcium, magnesium, phosphate, potassium, sodium, uric acid, CCR, bilirubin; creatinine clearance < 60 ml/min may be responsible for increased bone marrow suppression; assess frequently for infection

- **Assess for anaphylaxis:** pruritus, wheezing, tachycardia; may occur within a few minutes of use; notify physician after discontinuing products; resuscitation equipment should be available
- **Peripheral neuropathy:** may be increased in geriatrics
- Delay dental work until blood counts have returned to normal; regular toothbrushes, dental floss and toothpicks should not be used, use soft bristle toothbrush
- Monitor renal function studies: BUN, creatinine, serum uric acid, urine CCr before, during therapy; I&O ratio; report fall in urine output to <30 ml/hr
- Monitor temp q4hr (may indicate beginning of infection)
- Monitor liver function tests before, during therapy (bilirubin, AST, ALT, LDH) as needed or monthly; note jaundice of skin or sclera, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea
- Assess for **bleeding:** hematuria, stool guaiac, bruising or petechiae, mucosa or orifices; inflammation of mucosa, breaks in skin; avoid all IM injections if platelets $<50{,}000/mm^3$
- Identify effects of alopecia on body image; discuss feelings about body changes

### Patient/family education

- Advise patient to report ringing/roaring in the ears, numbness, tingling in face, extremities, weight gain

• Teach patient to avoid use of products containing aspirin or ibuprofen, NSAIDs, alcohol, razors, commercial mouthwash, since bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools)
• Instruct patient to report signs of **anemia** (fatigue, headache, irritability, faintness, shortness of breath); sore throat, bleeding, bruising, chills, back pain, blood in stools, dyspnea
• Instruct patient to report any changes in breathing or coughing even several months after treatment; to avoid crowds and persons with respiratory tract or other infections
• Advise patient that hair may be lost during treatment; a wig or hairpiece may make patient feel better; new hair may be different in color, texture
• Caution patient not to have any vaccinations without the advice of the prescriber; serious reactions can occur
• **Pregnancy/breastfeeding:** Teach patient that impotence or amenorrhea can occur; that this is reversible after treatment is discontinued; to notify prescriber if pregnancy is planned or suspected; that contraception should be used if patient is fertile
• Teach patient not to breastfeed
• Teach patient to notify prescriber immediately of fever, fatigue, sore throat, bleeding, bruising, chills, back pain, blood in stools, urine, emesis, dyspnea, tingling in extremities

### Evaluation

**Positive therapeutic outcome**
• Prevention of rapid division of malignant cells

## carisoprodol (Rx)

(kar-i-soe-proe′dole)
**Soma**
*Func. class.:* Skeletal muscle relaxant, central acting
*Chem. class.:* Meprobamate congener
**Controlled substance schedule IV**

**Do not confuse:** Soma/Soma compound

**ACTION:** Depresses CNS by blocking interneuronal activity in descending reticular formation of spinal cord, producing sedation and possibly altering pain perception

**Therapeutic outcome:** Relaxation of skeletal muscles

## USES:

Relieving pain, stiffness in musculoskeletal disorders

## CONTRAINDICATIONS

Hypersensitivity to these products or carbamates, intermittent porphyria

**Precautions:** Pregnancy, breastfeeding, geriatric, renal/hepatic disease, substance abuse, seizure disorder, CNS depression, abrupt discontinuation, Asian patients

## DOSAGE AND ROUTES

**Adult and child ≥16 yr:** PO 250-350 mg tid and at bedtime, max 3 wk of use

**Available forms:** Tabs 250, 350 mg

### Implementation

• Give with meals for GI symptoms
• Have patient use gum, frequent sips of water for dry mouth
• Store in tight container at room temperature
• Use for short term (2-3 wk), potential for habituation

## ADVERSE EFFECTS

**CNS:** *Dizziness, weakness, drowsiness,* headache, tremor, depression, insomnia, ataxia, irritability, seizures, confusion, flushing
**CV:** Postural hypotension, tachycardia
**EENT:** Diplopia, temporary loss of vision
**GI:** Nausea, vomiting, hiccups, epigastric discomfort
**HEMA:** Eosinophilia, pancytopenia
**INTEG:** Rash, pruritus, fever, facial flushing, erythema multiforme
**RESP:** Asthmatic attack
**SYST:** Angioedema, anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Crosses placenta |
| **Metabolism** | Liver, extensively, substrate of CYP2C19 |
| **Excretion** | Kidney, unchanged; breast milk |
| **Half-life** | 8 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ½ hr |
| **Peak** | 4 hr |
| **Duration** | 4-6 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
Meprobamate: do not use together

### Drug classifications

Antidepressants (tricyclic), barbiturates, opioids, sedative/hypnotics, avoid concurrent use: increased CNS depression
CYP2C19 inhibitors (FLUoxetine, fluvoxaMINE, isoniazid, modafinil): increased carisoprodol effect

CYP2C19 inducers (rifAMPin): decreased carisoprodol metabolite, decreasing carisoprodol effect

### Drug/herb

Kava, valerian: increased CNS depression
St. John's wort: increased metabolism of carisoprodol

### Drug/lab test

Increased: eosinophils
Decreased: RBC, WBC, platelets

## NURSING CONSIDERATIONS

### Assessment

- Pain: Monitor ROM, atrophy, stiffness, and pain in muscles; assess throughout treatment
- **Beers:** Avoid in older adults, may decrease urinary flow, cause retention (men), sedation, anticholinergic effects
- Monitor ECG in seizure patients; poor seizure control has occurred with patients taking this product
- Assess for idiosyncratic reaction within a few min or 1 hr of administration (disorientation, restlessness, weakness, euphoria, blurred vision); patient should be reassured that reaction is temporary, withhold and notify prescriber, usually seen in poor CYP2C19 metabolizers
- **Check for allergic reactions:** rash, fever
- CNS depression: Assess for dizziness, drowsiness, psychiatric symptoms, abuse potential
- **Abrupt discontinuation:** withdrawal reactions do occur but may be mild; dependence may occur
- **Pregnancy/breastfeeding:** Avoid use in pregnancy and breastfeeding

### Patient/family education

- Caution patient not to take with alcohol, other CNS depressants
- Advise patient to avoid altering activities while taking this product, to avoid rapid position changes, postural hypotension occurs, not to use for >2-3 wk
- Caution patient to avoid hazardous activities if drowsiness or dizziness occurs
- Caution patient to avoid using OTC medication such as cough preparations, antihistamines, unless directed by prescriber
- **Teach patient to report allergic reactions immediately:** rash, swelling of tongue/lips, hives, dyspnea
- Advise patient to take with food for GI symptoms

### Evaluation

**Positive therapeutic outcome**

- Decreased pain, spasticity

## TREATMENT OF OVERDOSE:

Lavage, dialysis

## carteolol ophthalmic

*See Appendix B*

**⚠ HIGH ALERT**

## carvedilol (Rx)

(kar-veh′dee-lol)
**Coreg, Coreg CR**
*Func. class.:* Antihypertensive α/β-blocker

**Do not confuse:** carvedilol/Captopril

**ACTION:** A mixture of nonselective β-blocking and α-blocking activity; decreases cardiac output, exercise-induced tachycardia, reflex orthostatic tachycardia; causes reduction in peripheral vascular resistance and vasodilatation

**Therapeutic outcome:** Decreased B/P in hypertension

**USES:** Essential hypertension alone or in combination with other antihypertensives, HF, LV dysfunction following MI, cardiomyopathy

## CONTRAINDICATIONS

Hypersensitivity, asthma, class IV decompensated cardiac failure, 2nd- or 3rd-degree heart block, cardiogenic shock, severe bradycardia, pulmonary edema, severe hepatic disease

**Precautions:** Pregnancy, breastfeeding, children, geriatric, cardiac failure, hepatic injury, peripheral vascular disease, anesthesia, major surgery, diabetes mellitus, thyrotoxicosis, emphysema, chronic bronchitis, renal disease, abrupt discontinuation

## DOSAGE AND ROUTES

### Essential hypertension

**Adult:** PO 6.25 mg bid × 7-14 days if tolerated well, then increase to 12.5 mg bid × 7-14 days if tolerated well, may be increased if needed to 25 mg bid, max 50 mg daily; ext rel cap 20 mg/day, may increase after 7-14 days to 40 mg/day, max 80 mg/day

### Congestive heart failure

**Adult:** PO 3.125 mg bid × 2 wk; if well tolerated, give 6.25 mg bid × 2 wk, then double q2wk to max dose 25 mg bid <85 kg or 50 mg bid >85 kg; ext rel cap (Coreg CR) 10 mg/day × 2 wk, increase to 20, 40, 80 mg/day over successive intervals of 2 wk

### Postmyocardial infarction

**Adult:** PO 6.25 mg bid with food ×3-10 days, a lower starting dose may be used if indicated, titrate upward as tolerated, may increase to 12.5 mg bid, then titrate to 25 mg bid; PO ext rel 20 mg/day with food, a lower starting dose of

10 mg/day may be used and titrate upwards after 3-10 days, increase to 40 mg/day as required

**Available forms:** Tabs 3.125, 6.25, 12.5, 25 mg; ext rel cap 10, 20, 40, 80 mg

### Implementation

- Take apical pulse before use, notify prescriber if <50 bpm and hold dose
- Give with food in morning regular; tablets may be crushed or swallowed whole, give with food to decrease orthostatic hypotension; do not break, crush, or chew ext rel cap; decreased anginal pain
- Administer reduced dosage in renal dysfunction

**BLACK BOX WARNING:** Do not discontinue prior to surgery

- Conversion from immediate release to extended release 3.125 mg bid is 10 mg qday; 6.25 mg bid is 20 mg qday; 12.5 mg bid is 40 mg; 25 mg bid is 8 mg

## ADVERSE EFFECTS

**CNS:** *Dizziness,* somnolence, insomnia, ataxia, hyperesthesia, paresthesia, vertigo, depression, *fatigue, weakness,* headache
**CV:** *Bradycardia, postural hypotension,* dependent edema, *peripheral edema,* AV block, extrasystoles, hypo/hypertension, palpitations, peripheral ischemia, HF, pulmonary edema
**GI:** *Diarrhea,* abdominal pain, increased alkaline phosphatase, increased ALT/AST, nausea, vomiting
**GU:** Decreased libido, *impotence,* UTI
**INTEG:** Rash, Stevens-Johnson syndrome, toxic epidermal necrolysis
**MISC:** Injury, back pain, viral infection, hypertriglyceridemia, thrombocytopenia, *hyperglycemia,* abnormal weight gain, aplastic anemia, anaphylaxis, angioedema
**RESP:** Rhinitis, pharyngitis, dyspnea, bronchospasm, cough, lung edema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Readily and extensively absorbed |
| **Distribution** | >98% protein binding |
| **Metabolism** | Extensively liver, some patients may be poor metabolizers |
| **Excretion** | Via bile into feces |
| **Half-life** | Terminal half-life 7-10 hr, increased in the geriatric, hepatic disease |

### Pharmacodynamics

Onset ext rel 30 min
Peak reg rel 1-2 hr, ext rel 5 hr
Duration: Reg rel 7-9 hr

## INTERACTIONS

### Individual drugs

Increase: Carvedilol level, CYP2D6 inhibitors FLUoxetine, quiNIDine
Alcohol (acute ingestion), cimetidine: increased toxicity, monitor for toxicity
CloNIDine: decreased heart rate, B/P, monitor B/P, pulse frequently
Digoxin: increased concentrations of digoxin
Reserpine, levodopa: increased hypotension, bradycardia
RifAMPin: decreased levels of carvedilol

### Drug classifications

Antihypertensives, nitrates: increased toxicity
Antidiabetic agents: increased hypoglycemia, insulin; monitor blood glucose level, dose of antidiabetics may need to be decreased
Calcium channel blockers: increased conduction disturbance
CYP2D6 inhibitors (FLUoxetine, quiNIDine): increased digoxin
MAOIs: increased bradycardia, hypotension
NSAIDs, thyroid hormones: decreased levels of carvedilol

### Drug/herb

Ephedra: decreased antihypertensive effect
Hawthorn: increased antihypertensive effect

### Drug/lab test

Increased: alk phos, serum creatinine blood glucose, potassium, triglycerides, uric acid, bilirubin, cholesterol, creatinine
Decreased: sodium, HDL

## NURSING CONSIDERATIONS

### Assessment

- Monitor I&O, weight daily
- **Hypertension:** Monitor B/P during beginning treatment and periodically thereafter; pulse q4hr, note rate, rhythm, quality
- Monitor apical/radial pulse before administration; in those with lower heart rate (<55 bpm) dose may need to be lowered, notify prescriber of significant changes, identify orthostatic hypotension when patient rises pulse <50 bpm hold product, notify prescriber
- **HF:** Assess for edema in feet and legs daily, fluid overload: dyspnea, weight gain, jugular vein distention, fatigue, crackles monitor I&O, worsening of heart failure may occur during beginning of treatment, check for compliance
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, no well-controlled studies, discontinue breastfeeding or product, excreted in breast milk

### Patient/family education

- Teach patient not to break, crush, or chew ext rel cap
- Instruct patient to comply with dosage schedule even if feeling better, that improvement may take several weeks, not to crush, chew caps
- Teach patient to rise slowly to sitting or standing position to minimize orthostatic hypotension
- Encourage patient to report bradycardia, dizziness, confusion, depression, fever, weight gain, shortness of breath, cold extremities, rash, sore throat, bleeding, bruising
- Teach patient to take pulse at home; advise when to notify prescriber
- Encourage patient not to discontinue product abruptly, taper over 1-2 wk, life-threatening dysrhythmias may occur
- Advise patient to avoid hazardous activities until stabilized on medication; dizziness may occur
- Teach patient that product may mask hypoglycemia, thyroid symptoms
- Advise patient to avoid all OTC medications unless approved by prescriber
- Advise patient to carry/wear emergency ID with product name, prescriber at all times
- Advise patient to inform all health care providers of products, supplements taken; advise patient to avoid all OTC medications unless approved by prescriber
- Teach patient to report if pregnancy is planned or suspected, pregnancy, do not breastfeed

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P
- Decreased symptoms of HF or angina

## cefaclor

*See cephalosporins—2nd generation*

## cefadroxil
## ceFAZolin

*See cephalosporins—1st generation*

## cefdinir
## cefditoren pivoxil
## cefepime
## cefotaxime

*See cephalosporins—3rd generation*

## cefoTEtan
## cefOXitin

*See cephalosporins—2nd generation*

## cefpodoxime

*See cephalosporins—3rd generation*

## cefprozil

*See cephalosporins—2nd generation*

## ceftaroline (Rx)

(sef-tar′oh-leen)

**Teflaro**

*Func. class.:* Cephalosporin derivative (fifth generation)

**ACTION:** Inhibits cell wall synthesis through binding to essential penicillin-binding protein (PBP)

**Therapeutic outcome:** Negative C&S, resolution of symptoms of infection

**USES:** Acute bacterial skin/skin structure infections (ABSSI), bacterial community acquired pneumonia

### CONTRAINDICATIONS

Cephalosporin hypersensitivity

**Precautions:** Antimicrobial resistance, breastfeeding, carbapenem/penicillin hypersensitivity, child/infant/neonate, coagulopathy, colitis, dialysis, diarrhea, geriatrics, GI disease, hypoprothrombinemia, IBS, pregnancy, pseudomembranous colitis, renal disease, ulcerative colitis, viral infection, vitamin K deficiency

### DOSAGE AND ROUTES

**Adult: IV** 600 mg q12hr × 5-14 days (skin/skin structure infections), × 5-7 days (bacterial community acquired pneumonia)

**Renal dose**

**Adult:** IV CCr >30-≤50 ml/min 400 mg q12hr; CCr ≥15-≤30 ml/min 300 mg q12hr, CCr <15 ml/min 200 mg q12hr

**Available forms:** Powder for injection 400 mg, 600 mg/vial

### Implementation

- Obtain C&S before use, first dose may be given before results are received
- Visually inspect for particulate matter or discoloration if solution or container permit
- Identify allergies before use

**Intermittent IV infusion route**

- **Reconstitute:** add 20 mg of sterile water to 400 or 600 mg vial (20 ml/ml for 400 mg), (30 mg/ml for 600 mg), mix gently until dissolved: **Dilute:** in 250 ml of 0.9% NaCl, 0.45% NaCl, LR, D5, D2.5, give over 1 hr, do not admix, use within 6 hrs at room temperature or 24 hr refrigerated
- Store reconstituted solution in the refrigerator

### ADVERSE EFFECTS

**CNS:** Dizziness, seizures

**CV:** Bradycardia, palpitations, phlebitis
**ENDO:** Hyperkalemia, hypokalemia
**GI:** Diarrhea, nausea, vomiting, constipation, abdominal pain, pseudomembranous colitis (rare), elevated hepatic enzymes
**HEMA:** Thrombocytopenia, neutropenia, anemia, eosinophilia
**INTEG:** Rash, anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Not hepatically metabolized |
| **Excretion** | In urine 88%, feces 6% |
| **Half-life** | 1.6 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Drug classifications

Anticoagulants: increased prothrombin time risk

### Drug/lab test

Increased: LFTs
Decreased: potassium, eosinophils, platelets

## NURSING CONSIDERATIONS

### Assessment

- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, no well-controlled studies, cautious use in breastfeeding, excreted in breast milk
- **Assess for infection:** vital signs, sputum, WBC prior to and during therapy
- **Assess for hypersensitivity:** prior to use, obtain a history of hypersensitivity reactions to cephalosporins, carbapenems, penicillins; cross sensitivity may occur
- **Assess for anaphylaxis (rare):** rash, pruritus, laryngeal edema, dyspnea, wheezing; discontinue and notify health care provider immediately, keep emergency equipment nearby
- **Monitor for pseudomembranous colitis:** diarrhea, abdominal pain, fever, bloody stools; report immediately if these occur, may occur several weeks after terminating therapy

### Patient/family education

- Explain reason for treatment and expected result
- Instruct patient to report immediately rash, itching, difficulty breathing, bloody diarrhea, fever, abdominal pain

### Evaluation

**Positive therapeutic outcome**

- Negative C&S, resolution of symptoms of infection

## cefTAZidime
## ceftibuten
## ceftizoxime
## cefTRIAXone

*See cephalosporins—3rd generation*

## cefuroxime

*See cephalosporins—2nd generation*

**⚠ HIGH ALERT**

## celecoxib (Rx)

(cel-eh-cox'ib)
**CeleBREX**
*Func. class.:* Nonsteroidal antiinflammatory, antirheumatic
*Chem. class.:* COX-2 inhibitor

**Do not confuse:** CeleBREX/CeleXA/Cerebra/Cerebyx

**ACTION:** Inhibits prostaglandin synthesis by selectively inhibiting cyclooxygenase 2 (COX-2), an enzyme needed for biosynthesis

**Therapeutic outcome:** Decreased pain, inflammation

**USES:** Acute, chronic rheumatoid arthritis, osteoarthritis, acute pain, primary dysmenorrhea, ankylosing spondylitis, juvenile rheumatoid arthritis (JRA)

**Unlabeled uses:** Colorectal adenoma prophylaxis

## CONTRAINDICATIONS

Pregnancy (3rd trimester), hypersensitivity to salicylates, iodides, other NSAIDs, sulfonamides, CABG

**Precautions:** Pregnancy (1st/2nd trimester), breastfeeding, children <18 yr, geriatric, renal/hepatic disease, hypertension, severe dehydration, bleeding, GI, cardiac disorders, PVD, asthma

**BLACK BOX WARNING:** GI bleeding/perforation, peptic ulcer disease, MI, stroke

## DOSAGE AND ROUTES

**Do not exceed recommended dose, deaths have occurred**

### Acute pain/primary dysmenorrhea

**Adult:** PO 400 mg initially, then 200 mg if needed on first day, then 200 mg bid prn on subsequent days, if needed; start with ½ dose in poor CYP2C9 metabolizers
**Geriatric:** PO use lowest possible dose

### Osteoarthritis
**Adult:** PO 200 mg/day as a single dose or 100 mg bid; start with ½ dose in poor CYP2C9 metabolizers
**Geriatric:** PO use lowest possible dose

### Rheumatoid arthritis
**Adult:** PO 100-200 mg bid; start with ½ dose in poor CYP2C9 metabolizers

### Ankylosing spondylitis
**Adult:** PO 200 mg daily or in divided dose (bid); start with ½ dose in poor CYP2C9 metabolizers

### Juvenile rheumatoid arthritis (JRA)
**Adolescent and child ≥2 yr (>25 kg):** PO 100 mg bid; start with ½ dose in poor CYP2C9 metabolizers
**Child ≥2 yr (10-25 kg):** PO 50 mg bid; start with ½ dose in poor CYP2C9 metabolizers

### Colorectal adenoma prophylaxis (unlabeled)
**Adult:** PO 200-400 mg bid for up to 3 yr

### Hepatic dose (Child-Pugh class II)
**Adult:** PO reduce dose by 50%; (Child-Pugh C) do not use

**Available forms:** Caps 50, 100, 200, 400 mg

### Implementation
- Do not break, crush, chew, or dissolve caps; caps may be opened and mixed with applesauce, ingest immediately with water
- Administer with food or milk to decrease gastric symptoms
- Do not increase dose

## ADVERSE EFFECTS
**CNS:** *Fatigue, anxiety, depression, nervousness, paresthesia,* dizziness, insomnia, headache
**CV:** Stroke, MI, tachycardia, HF, angina, palpitations, dysrhythmias, hypertension, fluid retention
**EENT:** Tinnitus, hearing loss, blurred vision, glaucoma, cataract, conjunctivitis, eye pain
**GI:** *Nausea, anorexia, vomiting, constipation, dry mouth,* diverticulitis, gastritis, gastroenteritis, hemorrhoids, hiatal hernia, stomatitis, GI bleeding/ulceration
**GU:** Nephrotoxicity: dysuria, hematuria, azotemia, cystitis, UTI, renal papillary necrosis
**HEMA:** Blood dyscrasias, epistaxis, anemia
**INTEG:** Purpura, rash, pruritus, sweating, erythema, petechiae, photosensitivity, alopecia, bruising, hot flashes, serious sometimes fatal Stevens-Johnson syndrome, toxic epidermal necrolysis, exfoliative dermatitis
**RESP:** Pharyngitis, shortness of breath, pneumonia, coughing

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO) |
| **Distribution** | Crosses placenta, protein binding ~97% |
| **Metabolism** | Liver by CYP2C9, some patients may be poor metabolizers |
| **Excretion** | Feces/kidneys, small amount |
| **Half-life** | 11 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 3 hr |
| **Duration** | Unknown |

## INTERACTIONS
### Individual drugs
Aspirin: decreased effectiveness; increased adverse reactions
Fluconazole: increased celecoxib level
Furosemide, cidofovir: decreased effect of each drug
Lithium: increased toxicity
Warfarin: increased anticoagulant effects

### Drug classifications
ACE inhibitors: may decrease effects of ACE inhibitors
Anticoagulants, antiplatelets, SSRIs, salicylates, thrombolytics: increased risk of bleeding
Antineoplastics: increased risk of hematologic toxicity
Bisphosphonates: increased toxicity
Glucocorticoids, NSAIDs: increased adverse reactions
Thiazide diuretics: decreased effectiveness of diuretics

### Drug/herb
Feverfew: decreased effect of feverfew
Garlic, ginger, ginkgo: increased bleeding risk

### Drug/lab test
Increased: ALT, AST, BUN, cholesterol, glucose, potassium, sodium
Decreased: glucose, sodium, WBC, platelets

## NURSING CONSIDERATIONS
### Assessment
- Assess for **pain** of rheumatoid arthritis, osteoarthritis; check ROM, inflammation of joints, characteristics of pain baseline and periodically
- **Beers:** Avoid use in older adults, may increase risk of kidney injury, exacerbate heart failure, increase fluid retention

**BLACK BOX WARNING:** Assess for cardiac disease that may be worse after taking this product; MI, stroke, do not use in coronary artery bypass graft (CABG)

• Monitor CBC during therapy; watch for decreasing platelets; if low, therapy may need to be discontinued, restarted after hematologic recovery; LFTs, serum creatinine BUN

**BLACK BOX WARNING:** Assess for **blood dyscrasias** (thrombocytopenia): bruising, fatigue, bleeding, poor healing

• **Assess for GI toxicity:** black, tarry stools; abdominal pain, monitor stool guaiac
• **Assess for serious skin disorders:** Stevens-Johnson syndrome, toxic epidermal necrolysis; may be fatal, treat symptomatically, may recur after therapy is discontinued, if severe may require discontinuing
• **Pregnancy/breastfeeding:** No well-controlled studies, birth defects and miscarriages are associated with NSAIDs in pregnancy, those who are pregnant and taking this product should register with the Teratology Information Specialists of Autoimmune Disease in Pregnancy Study 877-311-8972, discontinue breastfeeding or product

### Patient/family education

**BLACK BOX WARNING:** Do not exceed recommended dose; notify prescriber, immediately of chest pain, skin eruptions, stop product; hepatotoxicity: nausea, pruritus, yellowing skin, eyes; lethargy, itching, upper abdominal pain

• Teach patient that product must be continued for prescribed time to be effective; to avoid other NSAIDs, sulfonamides

**BLACK BOX WARNING:** Caution patient to report bleeding, bruising, fatigue, malaise, since blood abnormalities do occur; to report GI symptoms: black tarry stools, cramping

• Teach patient to take with a full glass of water to enhance absorption
• Teach patient to check with prescriber to determine when product should be discontinued before surgery; advise patient to notify prescriber if pregnancy is planned or suspected
• Advise patient to report possible respiratory infection: fever, shortness of breath, coughing, painful swallowing
• **Pregnancy/breastfeeding:** Teach patient to report if pregnancy is planned or suspected, do not use in breastfeeding or pregnancy

### Evaluation

**Positive therapeutic outcome**

• Decreased pain in arthritic conditions
• Decreased inflammation in arthritic conditions
• Decreased number of polyps (FAP)

## cephalexin

*See cephalosporins—1st generation*

## CEPHALOSPORINS—1ST GENERATION

**cefadroxil (Rx)**
(sef-a-drox′ill)
**Apo-Cefadroxil** 🍁, **Duricef** 🍁
**ceFAZolin (Rx)**
(sef-a′zoe-lin)
**Ancef** 🍁, **Kefzol** 🍁
**cephalexin (Rx)**
(sef-a-lex′in)
**Keflex** 🍁, **Panixine**

**ACTION:** Inhibits bacterial cell wall synthesis, rendering cell wall osmotically unstable, leading to cell death by binding to cell wall membrane, lysis mediated by cell wall autolytic enzymes

### >> cefadroxil

**Therapeutic outcome:** Bactericidal effects for the following: gram-negative bacilli *Escherichia coli, Proteus mirabilis, Klebsiella pneumoniae* (UTI only); gram-positive organisms *Streptococcus pneumoniae, Streptococcus pyogenes, Staphylococcus aureus/epidermidis*

**USES:** Upper, lower respiratory tract, urinary tract, skin infections; otitis media; tonsillitis, UTI

### >> ceFAZolin

**Therapeutic outcome:** Bactericidal effects for the following: gram-negative organisms *Haemophilus influenzae, Escherichia coli, Proteus mirabilis, Klebsiella;* gram-positive organisms *Staphylococcus aureus*

**USES:** Upper, lower respiratory tract, urinary tract, skin infections; bone, joint, biliary, genital infections; endocarditis, surgical prophylaxis, septicemia; *Streptococcus*

### >> cephalexin

**Therapeutic outcome:** Bactericidal effects for the following: gram-negative organisms *Haemophilus influenzae, Escherichia coli, Proteus mirabilis, Klebsiella pneumoniae;* gram-positive organisms *Streptococcus pneumoniae, Streptococcus pyogenes, Streptococcus agalactiae, Staphylococcus aureus*

**USES:** Upper, lower respiratory tract, urinary tract, skin, bone infections; otitis media

## CONTRAINDICATIONS

Hypersensitivity to cephalosporins, infants <1 mo

**Precautions:** Pregnancy, breastfeeding, hypersensitivity to penicillins, renal disease

## DOSAGE AND ROUTES

### >> cefadroxil

**Adult:** PO 1-2 g daily or divided q12hr, give a loading dose of 1 g initially
**Child:** PO 30 mg/kg/day in divided doses bid, max 2 g/day

#### Catheter-related bloodstream infections caused by methicillin-susceptible *S. aureus* or methicillin-susceptible coagulase staphylococcus

**Adults:** IV 2 g q8hr

#### Renal dose

**Adult:** PO CCr 25-50 ml/min, 1 g, then 500 mg q12hr; CCr 10-24 ml/min, 1 g, then 500 mg q24hr; CCr < 10 ml/min, 1 g, then 500 mg q36hr

**Available forms:** Caps 500 mg; tabs 1 g; oral susp 250, 500 mg/5 ml

### >> ceFAZolin

#### Life-threatening infections

**Adult:** IM/**IV** 1-2 g q6-8hr, max 12 g/day
**Child >1 mo:** IM/**IV** 75-100 mg/kg/day in 3-4 divided doses, max 6 g/day

#### Mild/moderate infections

**Adult:** IM/**IV** 250 mg-1 g q8hr, max 12 g/day
**Child >1 mo:** IM/**IV** 25-50 mg/kg in 3-4 equal doses, max 6 g/day or 2 g as a single dose

#### Renal dose

**Adult:** IM/IV following loading dose CCr 35-54 ml/min dose q8hr; CCr 10-34 ml/min 50% of dose q12hr; CCr <10 ml/min 50% of dose q18-24hr
**Child:** IM/IV CCr >70 ml/min, no dosage adjustment; CCr 40-70 ml/min following loading dose, reduce dose to 7.5-30 mg/kg q12hr; CCr 20-39 ml/min, give 3.125-12.5 mg/kg after loading dose q12hr; CCr 5-19 ml/min, 2.5-10 mg/kg after loading dose q24hr

**Available forms:** Inj 500 mg, 1, 10, 20 g; infusion 500 mg, 1 g/50 ml, 50 mg/500 ml vial

### >> cephalexin

#### Moderate infections

**Adult:** PO 250-500 mg q6hr, max 4 g/day
**Child:** PO 25-100 mg/kg/day in 4 equal doses, max 4 g/day

#### Moderate skin infections

**Adult:** PO 500 mg q12hr

#### Endocarditis prophylaxis

2 g 1 hr before procedure

#### Severe infections

**Adult:** PO 500 mg-1 g q6hr, max 4 g
**Child:** PO 50-100 mg/kg/day in 4 equal doses, max 4 g/day

#### Renal dose

**Adult:** PO CCr 30-59 ml/min max 1000 mg/day; CCr 15-29 ml/min 250 mg q 8-12 hr; CCr 5-14 ml/min 250 mg q 24 hr; CCr 1-4 ml/min 250 mg q 48-60 hrs

**Available forms:** Caps 250, 500, 750 mg; tabs 250, 500 mg, 1 g; oral susp 125, 250 mg/5 ml

### >> cefadroxil

#### Implementation

- Give in even doses around the clock; if GI upset occurs, give with food; product must be given for prescribed time to ensure organism death and prevent superinfection
- Shake susp, refrigerate, discard after 2 wk

### >> ceFAZolin

#### Implementation

**IM route**

- Reconstitute 250-500 mg of product with 2 ml sterile or bacteriostatic water for inj, or 0.9% NaCl; reconstitute 1 g of product with 2.5 ml; give deep in large muscle mass, massage

**IV route**

- Check for irritation, extravasation, phlebitis daily, change site q72hr
- For direct **IV** dilute in 2 ml/500 mg or 2.5 ml/1 g of sterile water for inj; give over 5 min
- For intermittent inf dilute reconstituted sol (500 mg or 1 g) in 50-100 ml $D_5W$, $D_{10}W$, $D_5$/0.25% NaCl, $D_5$/0.45% NaCl, $D_5$/0.9% NaCl, $D_5$/LR, or LR, 0.9% NaCl; give over 30-60 min; may be refrigerated up to 96 hr or stored 24 hr at room temperature

**Syringe compatibilities:** Heparin, Salbutamol, vit B complex

**Syringe incompatibilities:** Ascorbic acid inj, cimetidine, lidocaine, vit B/C

**Y-site compatibilities:** Acyclovir, alfentanil, allopurinol, alprostadil, amifostine, amikacin, aminocaproic acid, aminophylline, amphotericin B liposome, anidulafungin, ascorbic acid injection, atenolol, atracurium, atropine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium gluconate, CARBOplatin, cefamandole, cefmetazole, cefonicid,

cefoperazone, cefoTEtan, cefOXitin, cefpirome, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, cephalothin, cephapirin, chloramphenicol, cimetidine, CISplatin, clindamycin, codeine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, digoxin, dilTIAZem, DOCEtaxel, doxacurium, doxapram, DOXOrubicin liposomal, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, epoetin alfa, eptifibatide, esmolol, etoposide, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, fluorouracil, folic acid (as sodium salt), foscarnet, furosemide, gallium, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, indomethacin, insulin (regular), irinotecan, isoproterenol, ketorolac, lidocaine, linezolid, LORazepam, LR's injection, mannitol, mechlorethamine, melphalan, meperidine, metaraminol, methicillin, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, mezlocillin, miconazole, midazolam, milrinone, morphine, moxalactam, multiple vitamins injection, nafcillin, nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, pantoprazole, penicillin G potassium/sodium, peritoneal dialysis solution, perphenazine, PHENobarbital, phenylephrine, phytonadione, piperacillin, Plasma-Lyte M in dextrose 5%, polymyxin B, potassium chloride, procainamide, propofol, propranolol, raNITIdine, remifentanil, Ringer's injection, ritodrine, riTUXimab, sargramostim, sodium acetate, sodium bicarbonate, succinylcholine, SUFentanil, tacrolimus, teniposide, tenoxicam, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA, tolazoline, trastuzumab, trimetaphan, urokinase, vasopressin, vecuronium, verapamil, vinCRIStine, vitamin B complex with C, voriconazole, warfarin, zoledronic acid

**Y-site incompatibilities:** Amiodarone, hetastarch, HYDROmorphone, IDArubicin, vinorelbine tartrate

## >> cephalexin

### Implementation

- Do not break, crush, or chew caps
- Give in even doses around the clock; if GI upset occurs, give with food; product must be taken for 10-14 days to ensure organism death and prevent superinfection
- Shake susp, refrigerate, discard after 2 wk, use calibrated oral syringe, spoon or measuring cup

## ADVERSE EFFECTS

**CNS:** Headache, dizziness, weakness, paresthesia, fever, chills, seizures (high doses)
**GI:** Nausea, vomiting, *diarrhea, anorexia,* pain, glossitis, bleeding; increased AST, ALT, bilirubin, LDH, alkaline phosphatase; abdominal pain, pseudomembranous colitis
**GU:** Proteinuria, vaginitis, pruritus, candidiasis, increased BUN, nephrotoxicity, renal failure
**HEMA:** Leukopenia, thrombocytopenia, agranulocytosis, anemia, neutropenia, lymphocytosis, eosinophilia, pancytopenia, hemolytic anemia
**INTEG:** Rash, urticaria, dermatitis
**MS:** Arthralgia, arthritis
**RESP:** Dyspnea
**SYST:** Anaphylaxis, serum sickness, superinfection, Stevens-Johnson syndrome

## >> cefadroxil

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Not metabolized |
| **Excretion** | Unchanged by kidneys; enters breast milk |
| **Half-life** | 1½-2 hr |

### Pharmacodynamics

| | PO |
|---|---|
| **Onset** | Rapid |
| **Peak** | 1½-2 hr |
| **Duration** | 12-24 hr |

## >> ceFAZolin

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Not metabolized |
| **Excretion** | Unchanged by kidneys; enters breast milk |
| **Half-life** | 1½-2½ hr |

### Pharmacodynamics

| | IM | IV |
|---|---|---|
| **Onset** | Rapid | 10 min |
| **Peak** | 1-2 hr | Infusion's end |
| **Duration** | 6-12 hr | Unknown |

### >> cephalexin

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys, unchanged; enters breast milk |
| **Half-life** | ½-1 hr; increased in renal disease |

#### Pharmacodynamics

| | |
|---|---|
| **Onset** | 15-30 min |
| **Peak** | 1 hr |
| **Duration** | 6-12 hr |

## INTERACTIONS

### Individual drugs

Probenecid: increased toxicity

### Drug classifications

Aminoglycosides, diuretics (loop): increased toxicity
Anticoagulants: increased protime; use cautiously, monitor INR/PT

### Drug/lab test

Increased: AST, ALT, alkaline phosphatase, LDH, BUN, creatinine, bilirubin
False positive: urinary protein, direct Coombs' test, urine glucose
Interference: cross-matching

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for previous sensitivity reaction to penicillins or other cephalosporins; cross-sensitivity between penicillins and cephalosporins is common
- Assess patient for signs and symptoms of **infection** including characteristics of wounds, sputum, urine, stool, WBC >10,000/mm$^3$, earache, fever; obtain baseline information and during treatment
- Obtain C&S before beginning product therapy to identify if correct treatment has been initiated
- **Assess for anaphylaxis:** rash, urticaria, pruritus, chills, fever, joint pain; angioedema may occur a few days after therapy begins; EPINEPHrine and resuscitation equipment should be available for anaphylactic reaction, penicillin risk, cross-allergy may occur
- Identify urine output; if decreasing, notify prescriber (may indicate nephrotoxicity); also check for increased BUN, creatinine
- Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test monthly if patient is on long-term therapy
- Monitor electrolytes: potassium, sodium, chloride monthly if patient is on long-term therapy
- Assess bowel pattern daily; if severe diarrhea occurs, product should be discontinued; may indicate pseudomembranous colitis
- Monitor for bleeding: ecchymosis, bleeding gums, hematuria, stool guaiac daily if on long-term therapy
- **Assess for superinfection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum

### Patient/family education

- Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
- Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate superinfection
- Instruct patient to take all medication prescribed for the length of time ordered, take missed dose as soon as remembered, unless close to next dose, do not take a double dose, use calibrated device for syrup, liquid, suspension
- Advise patient to notify prescriber of diarrhea with blood, pus, mucus, which may indicate pseudomembranous colitis

### Evaluation

**Positive therapeutic outcome**

- Absence of signs/symptoms of infection (WBC <10,000/mm$^3$, temp WNL, absence of red draining wounds, earache)
- Reported improvement in symptoms of infection
- Negative C&S

**TREATMENT OF ANAPHYLAXIS:** EPINEPHrine, antihistamines, resuscitate if needed

### CEPHALOSPORINS—2ND GENERATION

**cefaclor (Rx)**
(sef'a-klor)
**Ceclor, Raniclor**

**cefoTEtan (Rx)**
(sef'oh-tee-tan)
**Cefotan**

**cefOXitin (Rx)**
(se-fox'i-tin)
**Mefoxin**

## cefprozil (Rx)

(sef-proe′zill)

**Cefzil** 🍁

## cefuroxime (Rx)

(sef-yoor-ox′eem)

**Ceftin, Kefurox** 🍁 **Cefuroxime, Zinacef**

*Func. class.:* Antiinfective

*Chem. class.:* Cephalosporin (2nd generation)

**Do not confuse:** **cefaclor**/cephalexin, **Cefotan**/Ceftin, **cefprozil**/ceFAZolin/cefuroxime, **Cefzil**/Ceftin

**ACTION:** Inhibits bacterial cell wall synthesis, rendering cell wall osmotically unstable, leading to cell death by binding to cell wall membrane

### >> cefaclor

**Therapeutic outcome:** Bactericidal effects for the following: gram-negative bacilli *Haemophilus influenzae, Escherichia coli, Proteus mirabilis, Klebsiella;* gram-positive organisms *Streptococcus pneumoniae, Streptococcus pyogenes, Staphylococcus aureus*

**USES:** Lower respiratory tract, urinary tract, skin infections; otitis media; infections

### >> cefoTEtan

**Therapeutic outcome:** Bactericidal effects for the following: gram-negative organisms *Citrobacter, Haemophilus influenzae, Escherichia coli, Enterobacter aerogenes, Proteus mirabilis, Klebsiella, Salmonella, Shigella, Acinetobacter, Bacteroides fragilis, Neisseria, Serratia;* gram-positive organisms *Streptococcus pneumoniae, Streptococcus pyogenes, Staphylococcus aureus*

**USES:** Serious upper or lower respiratory tract, urinary tract, gynecologic, skin, bone, joint, gonococcal, intraabdominal infections

### >> cefOXitin

**Therapeutic outcome:** Bactericidal effects for the following: gram-negative bacilli *Bacteroides fragilis, Haemophilus influenzae, Escherichia coli, Proteus, Klebsiella, Neisseria gonorrhoeae;* gram-positive organisms *Streptococcus pneumoniae, Streptococcus pyogenes, Staphylococcus aureus;* anaerobes including *Clostridium*

**USES:** Lower respiratory tract, urinary tract, skin, bone, gynecologic, gonococcal infections; septicemia, peritonitis

### >> cefprozil

**Therapeutic outcome:** Bactericidal effects for the following: gram-negative bacilli *Haemophilus influenzae, Escherichia coli;* gram-positive organisms *Streptococcus pneumoniae, Streptococcus pyogenes, Staphylococcus aureus*

**USES:** Pharyngitis/tonsillitis, otitis media, secondary bacterial infection of acute bronchitis, and acute bacterial exacerbation of chronic bronchitis and uncomplicated skin and skin structure infections; acute sinusitis

### >> cefuroxime

**Therapeutic outcome:** Bactericidal effects for the following: gram-negative bacilli *Haemophilus influenzae, Escherichia coli, Neisseria, Proteus mirabilis, Klebsiella;* gram-positive organisms: *Streptococcus pneumoniae, Streptococcus pyogenes, Staphylococcus aureus*

**USES:** Serious lower respiratory tract, urinary tract, skin, bone, joint, gonococcal infections; septicemia, meningitis, surgery prophylaxis

## CONTRAINDICATIONS

Hypersensitivity to cephalosporins or related antibiotics, seizures

**Precautions:** Pregnancy, breastfeeding, children, renal/GI disease, diabetes mellitus, coagulopathy, pseudomembranous colitis

## DOSAGE AND ROUTES

### >> cefaclor

**Adult:** PO 250-500 mg q8hr; EXT REL 500 mg q12hr; max 1.5 g/day (cap, oral susp); 1 g/day (EXT REL)

**Child >1 mo:** PO 20-40 mg/kg daily in divided doses q8hr, or total daily dose may be divided and given q12hr, max 1 g/day

**Available forms:** Caps 250, 500 mg; oral susp 125, 187, 250, 375 mg/5 ml; EXT REL tab 500 mg

### >> cefoTEtan

**Adult:** **IV**/IM 1-3 g q12hr × 5-10 days

**Perioperative prophylaxis**

**Adult:** **IV** 1-2 g ½-1 hr before surgery

**Renal dose**

**Adult:** IM/IV CCr 30-50 ml/min 1-2 g, then 1-2 g q8-12hr; CCr 10-29 ml/min 1-2 g, then 1-2 g q12-24hr; CCr 5-9 ml/min 1-2 g, then 0.5-1 g q12-24hr; CCr <5 ml/min 1-2 g, then 0.5-1 g q24-48hr

**Available forms:** Inj 1, 2, 10 g

### >> cefOXitin

**Adult:** IM/**IV** 1-2 g q6-8hr

**Uncomplicated gonorrhea (outpatient)**

**Adult/adolescent/child ≥45 kg:** IM 2 g as single dose with 1 g PO probenecid at same time

### Severe infections
**Adult:** IM/**IV** 2 g q4hr
**Child ≥3 mo:** IM/**IV** 80-160 mg/kg/day divided q4-6hr; max 12 g/day

**Available forms:** Powder for inj 1, 2, 10 g

## >> cefprozil
### Renal dose
CCr <30 ml/min 50% of dose

### Upper respiratory infections
**Adult:** PO 500 mg q24hr × 10 days

### Otitis media
**Child 6 mo-12 yr:** PO 15 mg/kg q12hr × 10 days

### Lower respiratory infections
**Adult:** PO 500 mg q12hr × 10 days

### Skin/skin structure infections
**Adult:** PO 250-500 mg q12hr × 10 days

**Available forms:** Tabs 250, 500 mg; susp 125, 250 mg/5 ml

## >> cefuroxime
Oral tablets and suspension are not bioequivalent

### Lower respiratory tract infections (mild-moderate)/uncomplicated skin/skin structure infections
**Adult/adolescent:** PO 250-500 mg q12hr × 5-10 days; IV/IM 750 mg q8hr
**Child (unlabeled):** PO 125 mg q12hr; 750 mg IV or IM q8hr
**Adolescent/child/infant ≥3 mo:** IV/IM 50-100 mg/kg/day divided q6-8hr (not to exceed adult dose)

### Serious lower respiratory tract infections/serious skin/skin structure infections
**Adult:** IV/IM 0.75-1.5 g q8hr; life-threatening infections or infections caused by less-susceptible organisms, IV 1.5 g q6hr
**Adolescent/child/infant ≥3 mo:** IV/IM 50-150 mg/kg/day divided q6-8hr; max 6 g/day

### Impetigo
**Child:** PO (tab unlabeled) 250 mg PO q12hr
**Child/infant ≥3 mo:** (PO-Susp) 30 mg/kg/day divided into two doses; max 1000 mg/day

### Urinary tract infection (UTI)
**Adult/adolescent:** PO 250 mg q12hr × 7-10 days; IV/IM 0.75-1.5 g q8hr (general) or 0.75 g q8hr (uncomplicated)
**Adolescent/child/infant ≥3 mo:** IV/IM 50-100 mg/kg/day in divided doses q6-8hr (max adult dose)

### Bone and joint infections
**Adult:** IV/IM 1.5 g q8hr; for life-threatening infections or infections caused by less-susceptible organisms, 1.5 g IV q6hr
**Adolescent/child/infant ≥3 mo:** IV/IM 150 mg/kg/day in divided doses q8hr; max 6 g/day

### Upper respiratory tract infections (e.g., pharyngitis, tonsillitis)
**Adult/adolescent:** PO (tabs) 250 mg q12hr × 10 days
**Child/infant ≥3 mo:** PO (susp) 20 mg/kg/day divided into 2 doses × 10 days, max 500 mg/day

### Acute bacterial maxillary sinusitis
**Adult/adolescent:** PO (tabs) 250 mg bid × 10 days
**Child (who can swallow tablets whole):** PO (tabs) 250 mg bid × 10 days
**Child/infant ≥3 mo:** PO (susp) 15 mg/kg bid × 10 days, max 1000 mg/day

### Early Lyme disease
**Adult/adolescent:** PO (tabs) 500 mg q12hr × 20 days
**Child (unlabeled):** PO (susp) 30 mg/kg/day in 2 divided doses (max 1000 mg/day) or 1000 mg/day × 14-21 days

### Acute otitis media
**Child (who can swallow whole tablets):** PO (tabs) 250 mg bid × 10 days
**Child/infant ≥3 mo:** PO (susp) 30 mg/kg/day divided into 2 doses × 10 day, max 1000 mg/day

### Septicemia
**Adult:** IV/IM 1.5-3 g q8hr, max 9 g/day
**Adolescent/child/infant ≥3 mo:** IV/IM 200-240 mg/kg/day divided doses q6-8hr, max 9 g/day

### Renal dose
**Adult:** CCr 10-20 ml/min: IV/IM 0.75-1.5 g, then 750 mg q12hr; CrCl <10 ml/min: IV/IM 0.75-1.5 g, then 750 mg q24hr
**Child:** The frequency of dosing should be modified consistent with the recommendations for adults

**Available forms:** Tabs 125, 250, 500 mg; inj 150, 750 mg, 1.5, 7.5 g; inj 750 mg; 1.5 g powder, susp 125, 250 mg/5 ml

### Implementation

## >> cefaclor
- Do not break, crush, chew, or cut EXT REL tabs
- Give in even doses around the clock; if GI upset occurs, give with food; product must be given for 10-14 days to ensure organism death and prevent superinfection
- Shake susp, refrigerate, discard after 2 wk
- Swallow EXT REL whole

### >> cefoTEtan

**IM route**

- Reconstitute 1 g/2 ml or 2 g/3 ml of sterile or bacteriostatic water for inj; may be diluted with 0.5% of 1% lidocaine to prevent pain; give deep in large muscle mass, massage

**IV route**

- May be stored 96 hr refrigerated or 24 hr at room temperature
- Check for irritation, extravasation, phlebitis daily; change site q72hr
- For direct **IV** dilute in 1 g/10 ml or more and give over 5 min
- For intermittent inf further dilute in 50-100 ml of 0.9% NaCl or $D_5W$; give over 3-5 min; discontinue primary line while running intermittent inf

**Y-site compatibilities:** Allopurinol, amifostine, aztreonam, dilTIAZem, famotidine, filgrastim, fluconazole, fludarabine, heparin, regular insulin, melphalan, meperidine, morphine, PACLitaxel, sargramostim, tacrolimus, teniposide, theophylline, thiotepa

### >> cefOXitin

**IM route**

- Reconstitute 1 g/2 ml of sterile water for inj; may be diluted with 0.5% or 1% lidocaine to prevent pain; give deep in large muscle mass, massage

**IV route**

- Check for irritation, extravasation, phlebitis daily; change site q72hr
- For direct **IV**, dilute 1 g/10 ml or 2 g/20 ml of sterile water for inj; shake, let stand until clear; give over 3-5 min
- For intermittent inf further dilute with 50-100 ml of $D_5W$, $D_{10}W$, $D_5$/0.25% NaCl, $D_5$/0.45% NaCl, $D_5$/0.9% NaCl, 0.9% NaCl $D_5$/LR, $D_5$/0.02%, sodium bicarbonate, Ringer's, or LR; give over 15-30 min; may store 96 hr refrigerated or 24 hr room temperature
- For cont inf dilute in 500-1000 ml; give over prescribed rate

**Y-site compatibilities:** Acyclovir, amifostine, aztreonam, cyclophosphamide, dilTIAZem, famotidine, fluconazole, foscarnet, HYDROmorphone, magnesium sulfate, meperidine, morphine, ondansetron, perphenazine, teniposide, thiotepa

**Y-site incompatibilities:** Hetastarch

### >> cefprozil

**IM route**

- Reconstitute with 1 g/2 ml or 2 g/3 ml of sterile or bacteriostatic water for inj; may be diluted with 0.5% or 1% lidocaine to prevent pain; give deep in large muscle mass, massage

**IV route**

- Check for irritation, extravasation, phlebitis daily; change site q72hr
- For direct **IV**, dilute 1 g/10 ml or more and give over 5 min
- For intermittent inf further dilute with 50-100 ml of 0.9% NaCl or $D_5W$; give over 3-5 min; discontinue primary line while running intermittent inf

**Y-site compatibilities:** Famotidine, fluconazole, fludarabine, regular insulin, meperidine, morphine, sargramostim

### >> cefuroxime

- Give for 10-14 days to ensure organism death, prevent superinfection, discard after 14 days
- Give with food if needed for GI symptoms
- Five after C&S obtained

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, fatigue, paresthesia, fever, chills, confusion

**GI:** *Diarrhea,* nausea, vomiting, anorexia, dysgeusia, glossitis, bleeding; increased AST, ALT, bilirubin, LDH, alkaline phosphatase; abdominal pain, loose stools, flatulence, heartburn, stomach cramps, colitis, jaundice, pseudomembranous colitis

**GU:** Vaginitis, pruritus, candidiasis, increased BUN, nephrotoxicity, renal failure, pyuria, dysuria, reversible interstitial nephritis

**HEMA:** Leukopenia, thrombocytopenia, agranulocytosis, anemia, neutropenia, lymphocytosis, eosinophilia, pancytopenia, hemolytic anemia, leukocytosis, granulocytopenia

**INTEG:** Rash, urticaria, dermatitis, Stevens-Johnson syndrome

**RESP:** Dyspnea

**SYST:** Anaphylaxis, serum sickness, superinfection

### >> cefaclor

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Not metabolized |
| **Excretion** | Unchanged by kidneys (60%-80%); enters breast milk |
| **Half-life** | 36-54 min; increased in renal disease |

#### Pharmacodynamics

| | |
|---|---|
| **Onset** | 15 min |
| **Peak** | ½-1 hr |
| **Duration** | Unknown |

### >> cefoTEtan

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (IM) |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys, unchanged; enters breast milk |
| **Half-life** | 5 hr; increased in renal disease |

#### Pharmacodynamics

| | IM | IV |
|---|---|---|
| **Onset** | Rapid | Immediate |
| **Peak** | 1-3 hr | Infusion's end |
| **Duration** | Unknown | Unknown |

### >> cefOXitin

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (IM) |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys, unchanged; enters breast milk |
| **Half-life** | ½-1 hr; increased in renal disease |

#### Pharmacodynamics

| | IM | IV |
|---|---|---|
| **Onset** | Rapid | Immediate |
| **Peak** | ½ hr | Infusion's end |
| **Duration** | Unknown | Unknown |

### >> cefprozil

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys (60%), unchanged; enters breast milk |
| **Half-life** | 1.3 hr (normal renal function); 2 hr (hepatic disease); 5¼-6 hr (end-stage renal disease) |

#### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Antacids: decreased absorption of cephalosporins
Furosemide: increased effect/toxicity
Plicamycin, valproic acid: increased bleeding
Probenecid: decreased excretion of product and increased blood levels/toxicity

### Drug classifications

Aminoglycosides: increased effect/toxicity
Anticoagulants, antiplatelets, NSAIDs, thrombolytics: increased bleeding (cefoTEtan)

### Drug/lab test

False: increased creatinine (serum urine), urinary 17-KS
False positive: urinary protein, direct Coombs' test, urine glucose (Clinitest)
Interference: cross-matching

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for previous sensitivity reaction to penicillins or other cephalosporins; cross-sensitivity between penicillins and cephalosporins is common
- Assess patient for signs and symptoms of **infection** including characteristics of wounds, sputum, urine, stool, WBC >10,000/mm$^3$, earache, fever; obtain baseline information and during treatment
- Obtain C&S before beginning product therapy to identify if correct treatment has been initiated
- **Assess for anaphylaxis:** rash, urticaria, pruritus, dyspnea, chills, fever, joint pain; angioedema may occur a few days after therapy begins; EPINEPHrine and resuscitation equipment should be available for anaphylactic reaction
- Identify urine output; if decreasing, notify prescriber (may indicate nephrotoxicity); also check for increased BUN, creatinine, urine output; if decreasing notify prescriber
- Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test monthly if patient is on long-term therapy
- Monitor electrolytes: potassium, sodium, chloride monthly if patient is on long-term therapy
- ***Clostridium difficile*–associated diarrhea (CDAD):** Assess bowel pattern daily; if severe diarrhea occurs, product should be discontinued
- Monitor for bleeding: ecchymosis, bleeding gums, hematuria, stool guaiac daily if on long-term therapy
- Assess for **overgrowth of infection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum

### Patient/family education

- Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate **blood dyscrasias** (rare); symptoms of hypersensitivity
- Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate **superinfection**
- Instruct patient to take all medication prescribed for the length of time ordered; to use yogurt or buttermilk to maintain intestinal flora, decrease diarrhea, take missed dose as soon as remembered unless close to next dose, do not take double dose, use calibrated device for syrup, liquid, suspension
- Advise patient to notify prescriber of diarrhea with blood or pus, which may indicate pseudomembranous colitis

### Evaluation

**Positive therapeutic outcome**

- Absence of signs/symptoms of infection (WBC $<10{,}000/mm^3$, temp WNL, absence of red draining wounds, earache)
- Reported improvement in symptoms of infection
- Negative C&S

**TREATMENT OF ANAPHYLAXIS:** EPINEPHrine, antihistamines, resuscitate if needed

## CEPHALOSPORINS—3RD/4TH GENERATION

**cefdinir (Rx)**
(sef′dih-ner)
**Omnicef**

**cefditoren pivoxil (Rx)**
(sef-dit′oh-ren pih-vox′il)
**Spectracef**

**(4th generation) cefepime (Rx)**
(sef′e-peem)
**Maxipime**

**cefixime (Rx)**
(sef-iks′ime)
**Cefixime, Suprax**

**cefotaxime (Rx)**
(sef-oh-taks′eem)
**Claforan**

**cefpodoxime (Rx)**
(sef-poe-docks′eem)
**Vantin**

**cefTAZidime (Rx)**
(sef′tay-zi-deem)
**Ceptaz, Fortaz, Tazicef**

**ceftibuten (Rx)**
(sef-ti-byoo′tin)
**Cedax**

**ceftizoxime (Rx)**
(sef-ti-zox′eem)
**Cefizox**

**cefTRIAXone (Rx)**
(sef-try-ax′one)
**Rocephin**

*Func. class.:* Broad-spectrum antibiotic
*Chem. class.:* Cephalosporin (3rd generation)

**Do not confuse:** cefTAZidime/ceftizoxime, Vantin/Ventolin

**ACTION:** Inhibits bacterial cell wall synthesis, rendering cell wall osmotically unstable, leading to cell death

### >> cefdinir

**Therapeutic outcome:** Bactericidal effects for the following: *Citrobacter diversus, Escherichia coli, Haemophilus influenzae, Haemophilus parainfluenzae, Klebsiella pneumoniae, Moraxella catarrhalis, Proteus mirabilis, Staphylococcus aureus, Staphylococcus epidermidis, Streptococcus agalactiae* (group B), *Streptococcus pneumoniae, Streptococcus pyogenes,* viridans streptococci alpha

**USES:** Uncomplicated skin and skin structure infections, community-acquired pneumonia, acute exacerbations of chronic bronchitis, acute maxillary sinusitis, pharyngitis, tonsillitis, otitis media

### >> cefditoren pivoxil

**Therapeutic outcome:** Bactericidal effects for the following organisms: *Haemophilus influenzae, Haemophilus parainfluenzae, Streptococcus pneumoniae, Moraxella catarrhalis, Streptococcus pyogenes, Staphylococcus aureus*

**USES:** Acute bacterial exacerbation of chronic bronchitis, pharyngitis/tonsillitis; uncomplicated skin, skin structure infections, community-acquired pneumonia, viridans streptococci

### >> cefepime

**Therapeutic outcome:** Bactericidal effects for the following: *Acinetobacter calcoaceticus, Acinetobacter lwoffii, Aeromonas hydrophila, Citrobacter diversus, Citrobacter freundii, Enterobacter, Escherichia coli, Gardnerella vaginalis, Hafnia alvei, Klebsiella, Moraxella catarrhalis, Morganella morganii, Neisseria gonorrhoeae, Neisseria meningitidis,*

*Proteus, Providencia rettgeri, Providencia stuartii, Pseudomonas aeruginosa, Salmonella, Serratia liquefaciens, Serratia marcescens, Shigella, Staphylococcus epidermidis, Staphylococcus saprophyticus, Streptococcus agalactiae, Streptococcus bovis, viridans streptococci, Yersinia enterocolitica*

**USES:** Lower respiratory tract, urinary tract, skin, bone, febrile neutropenia, intraabdominal infection

### >> cefixime

**Therapeutic outcome:** Bactericidal effects for the following organisms: *Escherichia coli, Proteus mirabilis, Streptococcus pyogenes, Haemophilus influenzae, Moraxella catarrhalis, Streptococcus pneumoniae*

**USES:** Uncomplicated UTI, pharyngitis/tonsillitis, otitis media, acute bronchitis, exacerbations of chronic bronchitis, uncomplicated gonorrhea

### >> cefotaxime

**Therapeutic outcome:** Bactericidal effects for the following: *Haemophilus influenzae, Haemophilus parainfluenzae, Escherichia coli, Enterococcus faecalis, Neisseria gonorrhoeae, Neisseria meningitidis, Proteus mirabilis, Klebsiella, Citrobacter, Serratia, Salmonella, Shigella Pseudomonas;* gram-positive organisms *Streptococcus pneumoniae, Streptococcus pyogenes, Staphylococcus aureus*

**USES:** Lower serious respiratory tract, urinary tract, skin, bone, gonococcal infections; bacteremia, septicemia, meningitis, skin, skin structure infections, CNS infections, perioperative prophylaxis, intraabdominal infections, PID, UTI, ventriculitis

### >> cefpodoxime

**Therapeutic outcome:** Bactericidal effects for the following: *Neisseria gonorrhoeae, Haemophilus influenzae, Escherichia coli, Proteus mirabilis, Klebsiella;* gram-positive organisms *Streptococcus pneumoniae, Streptococcus pyogenes, Staphylococcus aureus*

**USES:** Upper and lower respiratory tract, urinary tract, skin infections; otitis media, STDs

### >> cefTAZidime

**Therapeutic outcome:** Bactericidal effects for the following: *Haemophilus influenzae, Escherichia coli, Enterobacter aerogenes, Proteus mirabilis, Klebsiella, Citrobacter, Enterobacter, Salmonella, Serratia, Pseudomonas aeruginosa, Shigella, Acinetobacter, Bacteroides fragilis, Neisseria; Streptococcus pneumoniae, Streptococcus pyogenes, Staphylococcus aureus*

**USES:** Serious upper or lower respiratory tract, urinary tract, skin, gynecologic, bone, joint, intraabdominal infections; septicemia, meningitis, febrile neutropenia

### >> ceftibuten

**Therapeutic outcome:** Bactericidal effects for the following: *Haemophilus influenzae, Escherichia coli; Streptococcus pneumoniae, Streptococcus pyogenes, Staphylococcus aureus*

**USES:** Pharyngitis, tonsillitis, otitis media, secondary bacterial infection of acute bronchitis

### >> ceftizoxime

**Therapeutic outcome:** Bactericidal effects for the following: *Bacteroides, Haemophilus influenzae, Escherichia coli, Enterobacter aerogenes, Proteus mirabilis, Klebsiella, Enterobacter; Streptococcus pneumoniae, Streptococcus pyogenes, Staphylococcus aureus, Neisseria gonorrhoeae*

**USES:** Serious lower respiratory tract, urinary tract, skin, intraabdominal infections; septicemia, meningitis; bone, joint infections, PID

### >> cefTRIAXone

**Therapeutic outcome:** Bactericidal effects on the following: gram-negative organisms *Haemophilus influenzae, Escherichia coli, Enterobacter aerogenes, Proteus mirabilis, Klebsiella, Citrobacter, Enterobacter, Salmonella, Shigella, Acinetobacter, Bacteroides fragilis, Neisseria, Serratia;* gram-positive organisms *Streptococcus pneumoniae, Streptococcus pyogenes, Staphylococcus aureus*

**USES:** Serious lower respiratory tract, urinary tract, skin, gonococcal, intraabdominal infections; septicemia, meningitis; bone, joint infections, otitis media, PID

## CONTRAINDICATIONS

Hypersensitivity to cephalosporins, infants <1 mo

**Precautions:** Pregnancy, breastfeeding, children, hypersensitivity to penicillins, renal/GI disease, geriatrics, pseudomembranous colitis, viral infection, vit K deficiencies, diabetes

## DOSAGE AND ROUTES

### >> cefdinir

**Uncomplicated skin and skin structure infections/community-acquired pneumonia**

**Adult and child ≥13 yr:** PO 300 mg q12hr × 10 days

**Child 6 mo-12 yr:** PO 7 mg/kg q12hr or 14 mg/kg q24hr × 10 days

### Acute exacerbations of chronic bronchitis/acute maxillary sinusitis

**Adult and child ≥13 yr:** PO 300 mg q12hr or 600 mg q24hr × 10 days

### Pharyngitis/tonsillitis

**Adult and child ≥13 yr:** PO 300 mg q12hr or 600 mg q24hr × 5-10 days
**Child 6 mo-12 yr:** PO 7 mg/kg q12hr × 5-10 days or 14 mg/kg q24hr × 5-10 days

### Renal dose

*(CCr <30 ml/min)*
**Adult:** 300 mg/day
**Child:** 7 mg/kg/day

**Available forms:** Caps 300 mg, oral susp 125 mg/5 ml, 250 mg/5 ml

## >> cefditoren pivoxil

**Adult:** PO 200-400 mg bid × 10-14 days

### Renal dose

**Adult:** PO CCr 30-49 ml/min, max 200 mg bid; CCr <30 ml/min, max 200, 400 mg daily

**Available forms:** Tabs 200 mg

## >> cefepime

### Febrile neutropenia

**Adult/adolescent >16 yr/child ≥40 kg: IV** 2 g q8hr × 7 days or until neutropenia resolves
**Infant ≥2 mo/child/adolescent ≤16 yr and weighing up to 40 kg: IV** 50 mg/kg/dose q8hr × 7-10 days or until resolution

### Urinary tract infections (mild to moderate)

**Adult: IV**/IM 0.5-1 g q12hr × 7-10 days

### Urinary tract infections (severe)

**Adult/adolescent >16 yr/child ≥40 kg: IV** 2 g q12hr × 10 days

### Pneumonia (moderate to severe)

**Adult: IV** 1-2 g q12hr × 10 days

**Available forms:** Powder for inj 500 mg, 1, 2 g; 1 g/50 ml, 2 g/100 ml

## >> cefixime

### Mild to moderate pharyngitis, tonsillitis, bronchitis

**Adult/adolescent/child >45 kg:** PO 400 mg/day divided q12-24hr
**Child ≤45 kg and infant ≥6 mo:** PO 8 mg/kg/day divided q12-24hr

### Uncomplicated urinary tract infection (UTI)

**Adult/adolescent/child >45 kg:** PO 400 mg/day divided q12-24hr
**Child ≤45 kg and infant ≥6 mo:** PO 8 mg/kg/day divided q12-24hr max: 400 mg/day × 7-14 days is recommended by the American Academy of Pediatrics (AAP) for the treatment of initial UTI in febrile infants and young children 2-24 mo
**Infant 2-5 mo (unlabeled):** PO 8 mg/kg/day × 7-14 days is recommended by the American Academy of Pediatrics (AAP) for the treatment of initial UTI in febrile infants and young children

### Mild to moderate otitis media

**Adult/adolescent/child >45 kg:** PO 400 mg/day divided q12-24hr
**Child ≤45 kg:** PO 8 mg/kg/day divided q12-24hr, max: 400 mg/day
**Infant ≥6 mo:** PO 8 mg/kg/day divided q12-24hr

### Gonorrhea of uncomplicated cervicitis, or urethritis due to *N. gonorrhoeae*

**Adult/adolescent:** PO As alternative therapy, 400 mg as a single dose with a regimen effective against uncomplicated genital *C. trachomatis* infection (e.g., azithromycin as a single dose or doxycycline for 7 days) if chlamydial infection is not ruled out. The CDC states that cefixime is only acceptable if IM cefTRIAXone is not an option due to rising cefixime MICs for gonorrhea. If cefixime is used, test-of-cure should be done at the infected site 1 wk after treatment. Cefixime is not recommended for infections of the pharynx.
**Child ≥45 kg:** PO 400 mg as a single dose with a regimen effective against uncomplicated genital *C. trachomatis* infection (e.g., azithromycin as a single dose or doxycycline for 7 days) if chlamydial infection is not ruled out. Cefixime is not recommended for infections of the pharynx. Cefixime is an alternative to cefTRIAXone per the American Academy of Pediatrics (AAP).

### Renal dose

CCr 21-59 ml/min give 65% of dose; CCr <20 ml/min give 50% of dose

**Available forms:** Tabs 400 mg; powder for oral susp 100 mg/5 ml; cap 400 mg

## >> cefotaxime

**Adult/adolescent/child ≥50 kg:** IV/IM (uncomplicated infections) 1 g q12hr, (moderate-severe infections) 1-2 g q8hr, (severe infections) 2 g q6-8hr, (life-threatening infections) 2 g q4hr, max 12 g/day
**Adolescent/child <50 kg and infant:** IV/IM 50-180 mg/kg/day divided q6-8hr, max 2 g/dose, (severe infections 200-225 mg/kg/day divided q4-6hr max 12 g)
**Neonate >7 days:** IV/IM 50 mg/kg/dose q8-12hr

### Renal dose

**Adult:** IM CCr <20 ml/min 50% dose reduction

**Available forms:** Powder for inj 500 mg, 1, 2, 10 g; 1, 2 g premixed frozen

### >> cefpodoxime

**Pneumonia**
**Adult >13 yr:** PO 200 mg q12hr for 14 days

**Skin and skin structure**
**Adult >13 yr:** PO 400 mg q12hr for 7-14 days

**Pharyngitis and tonsillitis**
**Adult >13 yr:** PO 100 mg q12hr for 5-10 days
**Child 5 mo-12 yr:** PO 5 mg/kg q12hr (max 100 mg/dose or 200 mg/day) × 5-10 days

**Uncomplicated UTI**
**Adult >13 yr:** PO 100 mg q12hr for 7 days; dosing interval increased in presence of severe renal impairment

**Acute otitis media**
**Child 5 mo-12 yr:** PO 5 mg/kg q12hr for 5 days

**Available forms:** Tabs 100, 200 mg; granules for susp 50, 100 mg/5 ml

### >> cefTAZidime

**Adult:** **IV**/IM 1-2 g q8-12hr × 5-10 days
**Child:** **IV** 30-50 mg/kg q8hr, max 6 g/day
**Neonate:** **IV** 30-50 mg/kg q8-12hr

**Renal dose**
**Adult:** IV CCr 31-50 ml/min 1 g q12hr; CCr 16-30 ml/min 1 g q24hr; CCr 6-15 ml/min 1 g loading dose, then 0.5 g q24hr; CCr <5 ml/min 1 g loading dose, then 0.5 g q48hr

**Available forms:** Inj 250, 500 mg, 1, 2, 6 g

### >> ceftibuten

**Adult:** PO 400 mg daily × 10 days
**Child 6 mo-12 yr:** PO 9 mg/kg daily × 10 days

**Renal dose**
**Adult:** PO CCr 30-49 ml/min 200 mg q24hr; CCr 5-29 ml/min 100 mg q24hr

**Available forms:** Caps 400 mg; susp 90, 180 mg/5 ml

### >> ceftizoxime

**Adult:** IM/**IV** 1-2 g q8-12hr, may give up to 4 g q8hr in life-threatening infections
**Child >6 mo:** IM/**IV** 50 mg/kg q6-8hr

**Renal dose**
**Adult:** IM/IV CCr 50-79 ml/min; give loading dose 0.5-1 g, then 0.5 g q8h; CCr 5-49 ml/min give loading dose then 250-500, mg q12hr; CCr <5 ml/min give loading dose then 250-500 mg q24hr

**PID**
**Adult:** **IV** 2 g q8hr, may increase to 4 g q8hr in severe infections

**Available forms:** Premixed 1 g, 2 g/50 ml

### >> cefTRIAXone

**Adult:** IM/**IV** 1-2 g daily, max 4 g q24hr
**Child:** IM/**IV** 50-75 mg/kg/day in equal doses q12-24hr

**Uncomplicated gonorrhea**
**Adult:** 250 mg IM as single dose
Reduce dosage in severe renal impairment (CCr <10 ml/min)

**Available forms:** Inj 250, 500 mg, 1, 2, 10 g

**Implementation**

### >> cefdinir

**PO route**
- Give oral susp after adding 39 ml water to the 60 ml bottle; 65 ml water to the 12.0 ml bottle; discard unused portion after 10 days, give without regard to food, do not give within 2 hr of antacids, iron supplements

### >> cefditoren pivoxil

- Give for 10 days to ensure organism death, prevent superinfection
- Give with food if needed, do not give with antacids
- Give after C&S is completed

### >> cefepime

**IV route**
- Check for irritation, extravasation, phlebitis daily; change site q72hr
- For **intermittent inf** dilute with 50-100 ml of $D_5W$, give over 30 min

**Solution compatibilities:** 0.9% NaCl, $D_5$, 0.5, 1.0% lidocaine, bacteriostatic water for inj with parabens/benzyl alcohol

### >> cefixime

- Give for 10-14 days to ensure organism death, prevent superinfection

### >> cefotaxime

**IV route**
- **Dilute** 1 g/10 ml $D_5W$, NS, sterile water for inj and **give** over 3-5 min by Y-tube or 3-way stopcock; may be **diluted further** with 50-100 ml of 0.9% NaCl or $D_5W$; **run** over ½-1 hr; discontinue primary inf during administration; or may be diluted in larger volume of sol and given as a cont inf
- Give for 10-14 days to ensure organism death, prevent superinfection
- Thaw frozen container at room temperature or refrigeration, do not force thaw by immersion or microwave; visually inspect container for leaks

**Y-site compatibilities:** Acyclovir, alfentanil, alprostadil, amifostine, amikacin, aminocaproic

acid, aminophylline, anidulafungin, ascorbic acid injection, atenolol, atracurium, atropine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, caffeine, calcium chloride/gluconate, CARBOplatin, cefamandole, cefmetazole, cefonicid, cefoperazone, cefoTEtan, cefOXitin, cefTAZidime (L-arginine), cefTRIAXone sodium, cefuroxime, cimetidine, CISplatin, clindamycin, codeine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, digoxin, dilTIAZem, DOCEtaxel, DOPamine, doxacurium, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, epoetin alfa, eptifibatide, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, fludarabine, fluorouracil, folic acid, furosemide, gatifloxacin, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, ifosfamide, imipenem-cilastatin, insulin (regular), isoproterenol, ketorolac, lidocaine, linezolid, LORazepam, LR, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, metaraminol, methicillin, methotrexate, methoxamine, methyldopate, metoclopramide, metoprolol, metroNIDAZOLE, mezlocillin, miconazole, midazolam, milrinone, minocycline, mitoXANtrone, morphine, moxalactam, multiple vitamins, mycophenolate, nafcillin, nalbuphine, naloxone, nesiritide, netilmicin, nitroglycerin, nitroprusside, norepinephrine, normal saline, octreotide, ofloxacin, ondansetron, ornidazole, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, pantoprazole, papaverine, pefloxacin, PEMEtrexed, penicillin G potassium/sodium, pentamidine, pentazocine, PENTobarbital, peritoneal dialysis solution, perphenazine, PHENobarbital, phenylephrine, phenytoin, phytonadione, piperacillin, polymyxin B, potassium chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, quiNIDine, quinupristin, raNITIdine, remifentanil, Ringer's injection, ritodrine, riTUXimab, rocuronium, sargramostim, sodium acetate/bicarbonate, sodium fusidate, sodium lactate, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA, tobramycin, tolazoline, TPN, trastuzumab, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinorelbine, voriconazole

## >> cefpodoxime

**PO route**

- Do not break, crush, or chew tabs due to taste
- Give for 10-14 days to ensure organism death, prevent superinfection
- With food for better absorption, do not give within 2 hr of antacids, $H_2$ receptor antagonists
- Shake susp well, refrigerate, discard after 2 wk

## >> cefTAZidime

**IM route**

- **Fortaz, Tazidime vials:** Reconstitute 500 mg or 1 g with 1.5 or 3 ml, respectively, of sterile or bacteriostatic water for injection, or 0.5%-1% lidocaine (approx. 280 mg/ml)
- **Tazicef vials:** Reconstitute 1 g/3 ml sterile water for injection (approx. 280 mg/ml)
- **Ceptaz vials:** Reconstitute 1 g/3 ml sterile or bacteriostatic water for injection or 0.5%-1% lidocaine (approx. 250 mg/ml)
- Withdraw the dose, making sure the needle remains in the vial; ensure that no $CO_2$ bubbles are present; inject deeply in large muscle mass; aspirate prior to injection

**IV route**

- If possible, visually inspect for particulate matter and discoloration
- **Fortaz, Tazicef, Tazidime packs:** Reconstitute 1 or 2 g/100 ml sterile water for injection or other compatible **IV** sol (10 or 20 mg/ml, respectively). Reconstitution is done in two stages. First, inject 10 ml of the diluents into the pack and shake well to dissolve and become clear; $CO_2$ pressure inside the container will occur; insert a vent needle to release the pressure; add remaining diluents and remove vent needle
- **Fortaz, Tazicef, Tazidime vials:** Reconstitute 500 mg, 1 g, 2 g with 5, 10, 10 ml, respectively, of sterile water for injection or other compatible **IV** sol (100, 95-100, or 170-180 mg/ml, respectively; shake well to dissolve
- **Fortaz, Tazidime-ADD-Vantage vials** (for **IV** only): Reconstitute 1 or 2 g with NS, ½ NS, $D_5W$ in either 50 or 100 ml flexible diluents container; to release $CO_2$ pressure, insert a vent needle after dissolving; remove vent before using
- **Ceptaz packs:** Reconstitute 1 or 2 g/100 ml sterile water for injection or compatible **IV** sol (10 or 20 mg/ml, respectively). Reconstitution is done in two stages. First, inject 10 ml of the diluent into the pack and shake well to dissolve; add the remaining diluents; insert as vent needle before giving
- **Ceptaz vials:** Reconstitute 1 or 2 g/10 ml of sterile water for injection or compatible **IV** sol (90-95, or 170-180 mg/ml, respectively)
- **Ceptaz ADD-Vantage vials** (for **IV** infusion only): Reconstitute 1 or 2 g with NS, ½ NS, or $D_5W$ in either 50 or 100 ml diluent container as appropriate

**Direct intermittent IV infusion route**
• **Vials:** Withdraw the correct dose, making sure the needle opening remains in the solution; make sure there are no $CO_2$ bubbles in the syringe before injection; inject directly over 3-5 min or slowly into the tubing of a free-flowing compatible IV solution

**Intermittent IV infusion route**
• **Vials:** Withdraw the correct dose, making sure the needle opening remains in the solution; make sure there are no $CO_2$ bubbles in the syringe before injection; infusion packs and ADD-Vantage systems are ready for infusion after reconstitution; infuse over 15-30 min

### >> ceftibuten
• Administer for 10 days to ensure organism death, prevent superinfection
• Administer after C&S
• Administer on empty stomach

### >> ceftizoxime
**IM route**
• Reconstitute 250 mg/0.9 ml, 500 mg/1.8 ml, 1 g/3.6 ml, 2 g/7.2 ml; may be diluted with 0.5% or 1% lidocaine to prevent pain; give deep in large muscle mass, massage

**IV route**
• Check for irritation, extravasation, phlebitis daily; change site q72hr
• For intermittent inf reconstitute 250 mg/2.4 ml, 500 mg/4.8 ml, 1 g/9.6 mg/2 g/19.2 ml sterile water for inj, $D_5W$, or 0.9% NaCl; do not use sol with benzyl alcohol for neonates; may be further diluted in 50-100 ml of $D_5W$, $D_{10}W$, 0.9% NaCl, or LR; give over 15-30 min
• May store 96 hr refrigerated, 24 hr room temperature

**Y-site compatibilities:** Acetaminophen, acyclovir, allopurinol, amifostine, argatroban, aztreonam, enalaprilat, esmolol, famotidine, fludarabine, foscarnet, labetalol, melphalan, meperidine, morphine, ondansetron, sargramostim, teniposide, thiotepa, vinorelbine

### >> cefTRIAXone
• Give IM inj deep in large muscle mass
• Give for 10-14 days to ensure organism death, prevent superinfection

**IV route**
• Give **IV** after diluting 250 mg/2.4 ml of 500 mg/4.8 ml, 1 g/9.6 ml, 2 g/19.2 ml $D_5W$, water for inj, 0.9% NaCl; may be further diluted with 50-100 ml of 0.9% NaCl, $D_5W$, $D_{10}W$, shake; run over ½-1 hr
• Do not mix with calcium salts

**Y-site compatibilities:** Acyclovir, allopurinol, aztreonam, cisatracurium, dilTIAZem, DOXOrubicin liposome, fludarabine, foscarnet, heparin, melphalan, meperidine, methotrexate, morphine, PACLitaxel, remifentanil, sargramostim, tacrolimus, teniposide, theophylline, vinorelbine, warfarin, zidovudine

## ADVERSE EFFECTS
**CNS:** Headache, dizziness, weakness, paresthesia, fever, chills, seizures; dyskinesia, neurotoxicity (cefdinir)
**CV:** Heart failure, syncope (cefdinir)
**EENT:** *Oral candidiasis*
**GI:** *Nausea, vomiting, diarrhea, anorexia,* pain, glossitis, bleeding; increased AST, ALT, bilirubin, LDH, alkaline phosphatase; abdominal pain, pseudomembranous colitis, cholestasis (cefotaxime)
**GU:** Proteinuria, vaginitis, pruritus, *candidiasis,* increased BUN, nephrotoxicity, renal failure
**HEMA:** Leukopenia, thrombocytopenia, agranulocytosis, anemia, neutropenia, lymphocytosis, eosinophilia, pancytopenia, hemolytic anemia
**INTEG:** Rash, urticaria, dermatitis
**MS:** Arthralgia (cefditoren)
**RESP:** Dyspnea
**SYST:** Anaphylaxis, serum sickness, Stevens-Johnson syndrome, toxic epidermal necrolysis

### >> cefdinir
#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys, unchanged; enters breast milk |
| **Half-life** | 1.7 hr |

#### Pharmacodynamics
Unknown

### >> cefditoren pivoxil
#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed after it is broken down (prodrug) |
| **Distribution** | Widely |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 100 mins |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | 1.5-3 hr |
| **Duration** | 12 hrs |

## >> cefepime

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (IM) |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys, unchanged; enters breast milk |
| **Half-life** | 2 hr; increased in renal disease |

### Pharmacodynamics

| | IM | IV |
|---|---|---|
| **Onset** | Rapid | Immediate |
| **Peak** | 79 min | Infusion's end |
| **Duration** | Unknown | Unknown |

## >> cefixime

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 65%-70% |
| **Metabolism** | Unknown |
| **Excretion** | Urine, bile |
| **Half-life** | 3-4 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-6 hr |
| **Duration** | Unknown |

## >> cefotaxime

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Widely distributed |
| **Distribution** | Breast milk, small amounts |
| **Metabolism** | Liver, active metabolites |
| **Excretion** | 40%-65% unchanged, kidney |
| **Half-life** | 1 hr |

### Pharmacodynamics

| | IV | IM |
|---|---|---|
| **Onset** | 5 min | 30 min |
| **Peak** | Unknown | Unknown |
| **Duration** | Unknown | Unknown |

## >> cefpodoxime

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed; crosses placenta, protein binding 13%-38% |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys, unchanged; enters breast milk |
| **Half-life** | 1-1.5 hr, increased in renal disease |

### Pharmacodynamics

Unknown

## >> cefTAZidime

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (IM) |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys, unchanged; enters breast milk |
| **Half-life** | 1-2 hr; increased in renal disease |

### Pharmacodynamics

| | IM | IV |
|---|---|---|
| **Onset** | Rapid | Immediate |
| **Peak** | 1.5-2 hr | Infusion's end |

## >> ceftibuten

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys, unchanged; enters breast milk |
| **Half-life** | 1-1½ hr; increased in renal disease |

### Pharmacodynamics

Unknown

## >> ceftizoxime

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (IM) |
| **Distribution** | Widely distributed; crosses placenta, protein binding 30% |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys, unchanged; enters breast milk |
| **Half-life** | 1½-2 hr; increased in renal disease |

### Pharmacodynamics

| | IM | IV |
|---|---|---|
| **Onset** | Rapid | Immediate |
| **Peak** | 1 hr | Infusion's end |

## >> cefTRIAXone

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed; crosses placenta; enters CSF, protein binding 58%-96% |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, partly |
| **Half-life** | 6-9 hr |

### Pharmacodynamics

| | IM | IV |
|---|---|---|
| **Onset** | Rapid | Immediate |
| **Peak** | 1.5-4 hr | 30 min |

# INTERACTIONS

## Individual drugs

Many products should not be used with calcium salts (mixed or administered) or $H_2$ blockers antacids (PO)

CycloSPORINE: increased cycloSPORINE levels

Furosemide, probenecid: increased toxicity

Iron: decreased absorption of cefdinir

Plicamycin, valproic acid: increased bleeding

## Drug classifications

Aminoglycosides: increased toxicity

Anticoagulants, NSAIDs, thrombolytics: increased bleeding

## Drug/food

Iron-rich cereal, infants' formula: decreased absorption

## Drug/lab test

Increased: ALT, AST, alkaline phosphatase, LDH, bilirubin, BUN, creatinine

False increase: creatinine (serum urine), urinary 17-KS

False positive: urinary protein, direct Coombs' test, urine glucose

Interference: cross-matching

# NURSING CONSIDERATIONS

## Assessment

- Assess patient for previous sensitivity reaction to penicillins or other cephalosporins; cross-sensitivity between penicillins and cephalosporins is common
- Assess patient for signs and symptoms of **infection** including characteristics of wounds, sputum, urine, stool, WBC $>10{,}000/mm^3$, fever; obtain baseline information and during treatment
- Obtain C&S before beginning product therapy to identify if correct treatment has been initiated
- **Assess for anaphylaxis:** rash, urticaria, pruritus, chills, fever, joint pain; angioedema may occur a few days after therapy begins; EPINEPHrine and resuscitation equipment should be available for anaphylactic reaction
- Identify urine output; if decreasing, notify prescriber (may indicate nephrotoxicity); also check for increased BUN, creatinine
- Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test monthly if patient is on long-term therapy
- Monitor electrolytes: potassium, sodium, chloride monthly if patient is on long-term therapy
- Assess bowel pattern daily; if severe diarrhea occurs, product should be discontinued; may indicate pseudomembranous colitis
- Monitor for **bleeding:** ecchymosis, bleeding gums, hematuria, stool guaiac daily if on long-term therapy
- Assess for **overgrowth of infection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum
- Monitor heart rate during direct IV infusion (cefotaxime)

## Patient/family education

- Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
- Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate superinfection
- Advise patient to notify prescriber of diarrhea with blood or pus, may indicate pseudomembranous colitis
- To complete full course of treatment, take missed dose as soon as remembered unless close to next dose, do not take a double dose, use calibrated device for syrup, liquid suspension

### Evaluation

**Positive therapeutic outcome**

- Absence of signs/symptoms of infection (WBC $<10{,}000/mm^3$, temp WNL, absence of red draining wounds, earache)
- Reported improvement in symptoms of infection
- Negative C&S

**TREATMENT OF ANAPHYLAXIS:** EPINEPHrine, antihistamines, resuscitate if needed

## cephradine

*See cephalosporins—1st generation*

**⚠ HIGH ALERT**

## ceritinib

(cerr-ah-tin'ib)

**Zykadia**

*Func. class.:* Antineoplastic—Miscellaneous

*Chem. class.:* Protein-tyrosine kinase inhibitor

**ACTION:** A tyrosine kinase inhibitor targeting anaplastic lymphoma kinase (ALK); also targets insulinlike growth factors

**Therapeutic outcome:** Decreased progression of tumor

**USES:** Anaplastic lymphoma kinase (ALK)-positive metastatic non-small cell lung cancer (NSCLC) in patients who have progressed on or are intolerant to crizotinib

### CONTRAINDICATIONS

Pregnancy (**D**), hypersensitivity

**Precautions:** Breastfeeding, children, geriatric patients, cardiac/hepatic disease, GI bleeding, bone marrow suppression, infection, diarrhea, hyperglycemia, diabetes mellitus, nausea/vomiting, pancreatitis, pneumonitis, QT prolongation, torsade de pointes, bradycardia, cardiac arrhythmias, electrolyte imbalances, corticosteroid therapy

### DOSAGE AND ROUTES

**Adults: PO** 750 mg qday on an empty stomach until disease progression or unacceptable toxicity. Avoid the concomitant use of strong 3A4 inhibitors or inducers

#### Hepatic dose

**Adult:** PO ALT or AST >5 times above ULN and total bilirubin ≤ 2 times ULN: Hold product. When ALT/AST return to baseline or ≤ 3 times ULN, resume with a 150-mg dose reduction. Do not resume those unable to tolerate 300 mg qday

**Available forms:** Cap 150 mg

### Implementation

Dosage adjustments due to treatment-related toxicity QTc prolongation: QTc >500 msec on at least 2 separate ECGs: Hold. When QTc returns to <481 msec (or baseline if >481 msec), resume with a 150-mg dose reduction. Do not resume in those unable to tolerate 300 mg qday.

- Any occurrence, QTc prolongation in combination with torsade de pointes or polymorphic ventricular tachycardia or signs/symptoms of serious arrhythmia: Permanently discontinue
- **Bradycardia:** Symptomatic, but not life-threatening: Hold and evaluate other medications that may cause bradycardia. When asymptomatic or heart rate ≥60 bpm, resume with an adjusted dose, do not resume in those unable to tolerate 300 mg qday; life-threatening: discontinue product
- **Lipase or amylase >2 times the upper limit of normal (ULN):** Hold product and monitor serum lipase/amylase. When improved to <1.5 x ULN, resume with a 150-mg dose reduction. Do not resume in those unable to tolerate 300 mg qday
- **Any grade interstitial lung disease (ILD) or pneumonitis:** Permanently discontinue
- **Severe or intolerable nausea, vomiting, or diarrhea despite appropriate medical therapy:** Hold dose; when improved, resume with a 150-mg dose reduction. Do not resume in those unable to tolerate 300 mg qday
- **Persistent hyperglycemia >250 mg/dL despite optimal antihyperglycemic therapy:** Hold dose; when hyperglycemia is controlled, resume with a 150-mg dose reduction. Do not resume in those unable to tolerate 300 mg qday. If blood sugars cannot be controlled medically, discontinue

Dosage guidance in patients on strong CYP3A4 inducers/Inhibitors:

- **Strong CYP3A4 inhibitors:** Avoid concomitant use. If a strong CYP3A4 inhibitor is required, reduce the dose of ceritinib by approximately one-third, rounded to the nearest multiple of 150 mg; close monitoring of the QT interval is recommended. If the strong CYP3A4 inhibitor is discontinued, resume the previous dosage
- **Strong CYP3A4 inducers:** Avoid concomitant use

Take on an empty stomach. Do not give within 2 hr of a meal; swallow tablets whole; do not crush or dissolve; if a dose is missed, take as soon as remembered unless the next dose is due within

12 hr. Do not take 2 doses at the same time if missed; if vomiting occurs, do not give an additional dose. Take the next dose at the next scheduled time
Store at 77°F (25°C)

## ADVERSE EFFECTS

**CNS:** Weakness, fatigue, paresthesias
**CV:** QT prolongation, torsade de pointes, bradycardia
**EENT:** Blurred vision
**GI:** *Nausea,* hepatotoxicity, vomiting, *anorexia,* pancreatitis, GERD, *abdominal pain,* diarrhea
**INTEG:** *Rash*
**META:** Hyperglycemia, hyperphosphatemia, hyperamylasemia
**MISC:** Renal failure
**RESP:** Cough, dyspnea, pneumonitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein 97% |
| **Metabolism** | CYP3A4 |
| **Excretion** | Unknown |
| **Half-life** | 41 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 4-6 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Acetaminophen: increased hepatotoxicity
Warfarin: increased plasma concentration of warfarin; avoid use with warfarin; use low molecular weight anticoagulants instead
Simvastatin: increased plasma concentrations of simvastatin

### Drug classifications

CYP3A4 inhibitors (ketoconazole, itraconazole, erythromycin, clarithromycin): increased ceritinib concentrations
CYP3A4 inducers (dexamethasone, phenytoin, carBAMazepine, rifampin, PHENobarbital): decreased ceritinib concentrations

### Drug/herb

Decreased: ceritinib concentration—St. John's wort

### Drug/lab test

Increased: bilirubin, amylase, LFTs

## NURSING CONSIDERATIONS

### Assessment

- **Pregnancy:** Assess for pregnancy before starting treatment; effective contraception is needed during and for ≥ 2 wk after treatment
- **QT prolongation:** Assess for a history of cardiac arrhythmias, congestive heart failure, bradycardia, electrolyte imbalance, or congenital long QT syndrome. Correct electrolyte abnormalities before starting product
- **Hyperglycemia:** Monitor for hyperglycemia, may be 6-8-fold in diabetic patients
- **Pancreatitis:** Monitor for nausea, vomiting, severe abdominal pain

### Patient/family education

- **Pregnancy:** Teach patient to notify their provider immediately if pregnancy is suspected; effective contraception is needed during and for ≥ 2wk after treatment; if product is used during pregnancy or if the patient becomes pregnant during use, the woman should be apprised of the potential hazard to the fetus
- Teach patient about reason for treatment, expected results
- Teach patient to report adverse reactions immediately: abdominal pain, nausea, vomiting, increased blood glucose in diabetics
- Advise patient to avoid OTC products unless approved by prescriber

### Evaluation

**Positive therapeutic outcome**

- Decreased spread of tumor

## certolizumab pegol (Rx)

(ser'tue-liz'oo-mab) (pegh'ol)
**Cimzia**
*Func. class.:* GI antiinflammatory, antirheumatic
*Chem. class.:* Anti-TNF (tissue necrosis factor) agent

**ACTION:** Monoclonal antibody that neutralizes the activity of tumor necrosis factor-α (TNF-α) found in Crohn's disease; decreased infiltration of inflammatory cells

**Therapeutic outcome:** Absence of fever, mucus in stools

**USES:** Crohn's disease (moderate-severe) that has not responded to conventional therapy, rheumatoid arthritis (moderate-severe), psoriatic arthritis, ankylosing spondylitis

## CONTRAINDICATIONS

Influenza, **IV** administration, sepsis, hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, geriatric patients, AIDS, coagulopathy, diabetes, fungal infection, heart failure, hepatitis, human anti-chimeric antibody, immunosuppression,

leukopenia, MS, cancer, neurologic disease, surgery, thrombocytopenia, TB, vaccinations, renal disease

**BLACK BOX WARNING:** Infection, neoplastic disease in children

## DOSAGE AND ROUTES

### Crohn's disease (moderate-severe)

**Adult:** SUBCUT 400 mg given as 2 inj at wk 0, 2, 4; if clinical response occurs, give 400 mg q4wk

### Rheumatoid arthritis (moderate-severe)

**Adult:** SUBCUT 400 mg (as two injections of 200 mg) once, then repeat at wk 2 and 4; maintenance, 200 mg q2wk or 400 mg q4wk

**Available forms:** Solution for inj 200; powder for solution 400 mg kit

### Implementation

- Store in refrigerator; do not freeze

**SUBCUT route**

- Give by SUBCUT only
- Allow reconstitution to warm to room temp; add 1 ml sterile water for inj to each vial; two vials will be needed for Crohn's disease
- Gently swirl; do not shake; full reconstitution may take up to 30 min; reconstituted product may remain at room temp for up to 2 hr or refrigerated up to 24 hr
- Warm to room temperature if reconstituted product has been refrigerated
- Use 2 syringes and 2 20-G needles
- Withdraw reconstituted sol from each vial into separate syringes; each will contain 200 mg; switch 20-G to 23-G needle; inject into 2 separate sites in abdomen or thigh

## ADVERSE EFFECTS

**CNS:** *Dizziness,* syncope, peripheral neuropathy, fever, seizures, demyelinating disease of CNS
**CV:** Heart failure, MI, cardiac dysrhythmia
**EENT:** Optic neuritis, retinal hemorrhage, uveitis
**GI:** Increased LFTs, hepatitis, bowel obstruction
**GU:** UTI, renal disease
**HEMA:** Anemia, aplastic anemia, pancytopenia, thrombocytopenia
**INTEG:** *Rash, urticaria,* angioedema
**RESP:** Dyspnea, URI
**MISC:** *Infection*
**SYST:** Anaphylaxis, malignancies, serum sickness, bleeding, antibody formation, infection, lupus-like symptoms, lymphadenopathy, arthralgia, suicidal ideation

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Terminal 14 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 54-171 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Abatacept, adalimumab, anakinra, etanercept, infliximab, do not use concurrently, rilonacept: increased possible infections
Adalimumab, etanercept, infliximab: increased possible malignancies

### Drug classifications

Immunosuppressive agents: increased possible infections, do not use concurrently
Live vaccines, toxoids: do not administer concurrently

## NURSING CONSIDERATIONS

### Assessment

- Monitor antibody test (ANA), hepatitis B serology, CBC with differential
- Assess rheumatoid arthritis/ankylosing spondylitis: pain, range of motion baseline and during treatment
- Assess GI symptoms: nausea, vomiting, abdominal pain, hepatitis, increased LFTs
- Assess CV status: B/P, pulse, chest pain
- **Assess for allergic reaction, anaphylaxis:** rash, dermatitis, urticaria, dyspnea, hypotension, fever, chills; discontinue if severe, administer EPINEPHrine, corticosteroids, antihistamines; assess for allergies to murine proteins before starting therapy
- **Hepatitis B virus:** Carriers of HBV should be monitored, those at risk for HBV should be evaluated before use

**BLACK BOX WARNING:** Fungal infection: Fever, weight loss, diaphoresis, fatigue, dyspnea; assess **infections:** discontinue if infection occurs; do not administer to patients with active infections

**BLACK BOX WARNING:** Identify TB, risk for HBV before beginning treatment; a TB test should be obtained; if present, TB should be treated prior to receiving inFLIXimab

**BLACK BOX WARNING:** Do not use in children, lymphoma may occur

### Patient/family education

- Instruct patient not to breastfeed while taking this product
- Advise patient to notify prescriber of GI symptoms, hypersensitivity reactions, infections, fluid retention, redness, pain, swelling at injection site
- Caution patient not to operate machinery, drive if dizziness, vertigo occur

### Evaluation

**Positive therapeutic outcome**

- Absence of fever, mucus in stools; decreased inflammation in joints

## cetirizine (Rx)

(se-tear′i-zeen)

**Reactine, ZyrTEC**

*Func. class.:* Antihistamine, peripherally selective (2nd generation)

*Chem. class.:* Piperazine, $H_1$ histamine antagonist

**Do not confuse:** Cetirizine/sertraline/stavudine, ZyrTEC/Xanax/Zantac/Zocor/ZyPREXA/Zerit

**ACTION:** Acts on blood vessels, GI, respiratory system by competing with histamine for $H_1$-receptor site; decreases allergic response by blocking pharmacologic effects of histamine; minimal anticholinergic/sedative action

**Therapeutic outcome:** Absence of allergy symptoms, rhinitis, and chronic idiopathic urticaria

**USES:** Rhinitis, allergy symptoms, and chronic idiopathic urticaria

## CONTRAINDICATIONS

Hypersensitivity to this product or hydrOXYzine, breastfeeding, newborn or premature infants, severe hepatic disease

**Precautions:** Pregnancy, children, geriatric, respiratory disease, closed-angle glaucoma, prostatic hypertrophy, bladder neck obstruction, asthma

## DOSAGE AND ROUTES

Perennial/seasonal allergic rhinitis or idiopathic urticaria

**Adult and child ≥6 yr:** PO 5-10 mg daily

**Child 2-5 yr:** PO 2.5 mg daily, may increase to 5 mg daily or 2.5 mg bid

**Child 1-2 yr:** PO 2.5 mg daily, may increase to 2.5 mg q12hr

**Child 6-11 mo:** PO 2.5 mg daily

**Geriatric:** PO 5 mg daily, may increase to 10 mg/day

### Self-treatment of hay fever/other respiratory allergies

**Adult/adolescent/child ≥6 yr:** PO 10 mg/day, oral SOL 5-10 mg/day

### Renal dose

**Adult:** PO CCr 11-31 ml/min 5 mg daily

### Hemodialysis

**Adult:** PO 5 mg/day

### Hepatic dose

**Adult:** PO 5 mg daily

**Available forms:** Tabs 5, 10 mg; syr 5 mg/5 ml; prefilled spoons 1 mg/ml; oral sol 5 mg/5 ml; liquid filled cap 10 mg; chew tab 5, 10 mg; orally disintegrating tab 10 mg

### Implementation

- Give without regard to meals
- Store in tight, light-resistant container
- **Caps:** swallow whole, do not break, cut, chew, crush
- **Chew tabs:** chew before swallowing, may use without or with water
- **Oral liquid:** use calibrated measuring device

## ADVERSE EFFECTS

**CNS:** *Headache,* stimulation, *drowsiness,* sedation, *fatigue,* confusion, blurred vision, tinnitus, restlessness, tremors, paradoxical excitation in children or geriatric

**GI:** *Dry mouth,* increased liver function tests, constipation

**INTEG:** Rash, eczema, photosensitivity, urticaria

**RESP:** *Thickening of bronchial secretions;* dry nose, throat

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed, rapid |
| **Distribution** | Protein binding 93% |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | 8.3 hr, decreased in children, increased in renal/hepatic disease |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ½ hr |
| **Peak** | 1-2 hr |
| **Duration** | 24 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression

Ritonavir: increased cetirizine effect

### Drug classifications
CNS depressants, opioids, sedative/hypnotics: increased CNS depression
MAOIs: increased anticholinergic effect

### Drug/food
Prolongs absorption by 1.7 hr

### Drug/lab test
False negative: skin allergy tests (discontinue antihistamine 3 days before testing)

## NURSING CONSIDERATIONS
### Assessment
- Assess respiratory status: rate, rhythm; increase in bronchial secretions, wheezing, chest tightness; provide fluids to 2 L/day to decrease secretion thickness
- Assess for **allergy symptoms:** pruritus, urticaria, watering eyes, baseline, during treatment
- **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding

### Patient/family education
- Teach all aspects of product uses; to notify prescriber if confusion, sedation, hypotension occur; to avoid driving or other hazardous activity if drowsiness occurs; to avoid alcohol or other CNS depressants that may potentiate effect
- Instruct patient to take without regard to meals
- Instruct patient not to exceed recommended dose; dysrhythmias may occur
- Advise patient to avoid using if breastfeeding
- Advise patient to avoid exposure to sunlight; burns may occur
- Advise patient to use sugarless gum, candy, frequent sips of water to minimize dry mouth
- Advise patient to avoid alcohol, OTC antihistamines, other CNS depressants

### Evaluation
**Positive therapeutic outcome**
- Absence of runny or congested nose, rashes

## TREATMENT OF OVERDOSE:
Lavage, diazePAM, vasopressors, phenytoin IV

**RARELY USED**

**⚠ HIGH ALERT**

## cetrorelix (Rx)
(set-roe-ree'lix)
**Cetrotide**
*Func. class.:* Gonadotropin-releasing
*Chem. class.:* Synthetic decapeptide

**Therapeutic outcome:** Pregnancy

## USES: For inhibition of premature LH surges in women undergoing controlled ovarian hyperstimulation

## CONTRAINDICATIONS
Pregnancy, breastfeeding, hypersensitivity, latex allergy, renal disease, KRA5 mutation

**Precautions:** Geriatric, bronchospasm

## DOSAGE AND ROUTES
### Single-dose regimen
**Adult:** SUBCUT 3 mg when serum estradiol level is at appropriate stimulation response, usually on stimulation day 7; if hCG has not been given within 4 days after inj of 3 mg cetrorelix, give 0.25 mg daily until day of hCG administration

### Multiple-dose regimen
**Adult:** SUBCUT 0.25 mg is given on stimulation day 5 (either morning or evening) or 6 (morning) and continued daily until day hCG is given

### Evaluation
**Positive therapeutic outcome**
- Pregnancy

## cetuximab (Rx)
(se-tux'i-mab)
**Erbitux**
*Func. class.:* Antineoplastic—miscellaneous, monoclonal antibody
*Chem. class.:* Epidermal growth factor receptor inhibitor

## ACTION: Not fully understood; binds to K-RAS wild type epidermal growth factor receptors (EGFRs); inhibits phosphorylation and activation of receptor-associated kinase resulting in inhibition of cell growth

**Therapeutic outcome:** Decrease in tumor size

## USES: Alone or in combination with irinotecan for K-RAS wild type EGFR expressing metastatic colorectal carcinoma, head/neck cancer

## CONTRAINDICATIONS
Hypersensitivity to this product or murine proteins

**Precautions:** Pregnancy, breastfeeding, child, geriatric, CV/renal/hepatic disease, ocular, pulmonary disorders, arrhythmias, CAD, platinum-based therapy infusion-related reactions, radiation, cardiac, respiratory arrest

**BLACK BOX WARNING:** Cardiac arrest

## DOSAGE AND ROUTES
**Adult: IV** INF 400 mg/m$^2$ loading dose given over 120 min, max INF rate 5 ml/min, weekly

maintenance dose (all other infusions) is 250 mg/m$^2$ given over 60 min, max INF rate 5 ml/min (10 mg/min); premedicate with an $H_1$ antagonist (diphenhydrAMINE 50 mg **IV**); dosage adjustments are made for INF reactions or dermatologic toxicity; other protocols are used

**Available forms:** Sol for inj 100 mg/50 ml, 200 mg/100 ml

**Premedicate with diphenhydrAMINE** 50 mg 30-60 min before first dose, use during infusion for reactions

### Implementation

**Intermittent infusion route**

- Administer by **IV** infusion only, do not give by **IV** push or bolus
- Do not shake or dilute
- Do not dilute with other products
- **Infusion pump:** draw up volume of a vial using appropriate syringe/needle (a vented spike or other appropriate transfer device); fill Erbitux into sterile evacuated container/bag, repeat until calculated volume has been put into the container. Use a new needle for each vial; give through in-line filter (low protein binding 0.22-micrometer); affix inf line and prime before starting inf, max rate 5 ml/min; flush line at end of inf with 0.9% NaCl
- **Syringe pump:** Draw up volume of a vial using appropriate syringe/needle (a vented spike); place syringe into syringe driver of a syringe pump and set rate; use an in-line filter 0.22 micrometer (low protein binding); connect inf line and start inf after priming; repeat until calculated volume has been given
- Use a new needle and filter for each vial, max 5 ml/min rate; use 0.9% NaCl to flush line after inf
- Do not piggyback to patient inf line
- Observe patient for adverse reactions for 1hr after inf

**BLACK BOX WARNING:** Inf reactions (bronchospasm, stridor, urticaria, hypotension, MI): if mild (grade 1 or 2) reduce all doses by 50%; if severe (grade 3 or 4) permanently discontinue, monitor for at least 1 hr after completion of therapy, reactions usually occur during first dose, have emergency equipment nearby

- Store refrigerated 36°-46° F, discard unused portions

## ADVERSE EFFECTS

**CNS:** *Headache, insomnia, depression,* aseptic meningitis
**CV:** Cardiac arrest
**GI:** *Nausea, diarrhea, vomiting, anorexia, mouth ulceration, dehydration, constipation, abdominal pain*
**HEMA:** Leukopenia, anemia, neutropenia
**INTEG:** Rash, pruritus, acne, dry skin, toxic epidermal necrolysis, angioedema, *blepharitis, cheilitis, cellulitis, cysts, alopecia, skin/nail disorder,* acute infusion reactions, other skin toxicities
**MISC:** *Conjunctivitis, asthma, malaise, fever,* renal failure, hypomagnesemia
**MS:** *Back pain*
**RESP:** Interstitial lung disease, *cough, dyspnea,* pulmonary embolus, *peripheral edema,* respiratory arrest
**SYST:** Anaphylaxis, sepsis, infection, Stevens-Johnson syndrome, toxic epidermal necrolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 114 hrs |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 168-235 g/ml |
| **Duration** | Steady state by 3rd weekly infusion |

## INTERACTIONS

### Drug/lab test

Increase: LFTs

## NURSING CONSIDERATIONS

### Assessment

Monitor pulmonary changes: lung sounds, cough, dyspnea; interstitial lung disease may occur, may be fatal; discontinue therapy if confirmed

**BLACK BOX WARNING:** Cardiac arrest: monitor electrolytes; in those undergoing radiation therapy, electrolytes may be decreased

- Assess for toxic epidermal necrosis, angioedema, anaphylaxis, Stevens-Johnson syndrome
- Assess GI symptoms: frequency of stools, dehydration, abdominal pain, stomatitis
- Obtain **K-RAS mutation** in metastatic colorectal carcinoma; if K-RAS mutation in codon 12 or 13 is detected, then patient should not receive anti-EGFR antibody therapy
- **Pregnancy/breastfeeding:** May cause fetal harm, use only if benefits outweigh fetal risk, do not breastfeed during and for 6 mo after final dose

### Patient/family education

Instruct patient to report adverse reactions immediately: SOB, severe abdominal pain, skin eruptions

- Explain reason for treatment, expected results

**BLACK BOX WARNING:** Instruct patient to use contraception during treatment and for 6 mo after treatment, both female and male, not to breastfeed during and for 6 mo after treatment

- Advise patient to wear sunscreen and hat to limit sun exposure; sun exposure can exacerbate any skin reactions

### Evaluation

**Positive therapeutic outcome**

- Decrease growth, spread of EGFR expressing metastatic colorectal carcinoma

## chlordiazePOXIDE (Rx)

(klor-dye-az-e-pox'ide)

**Librium**

*Func. class.:* Antianxiety

*Chem. class.:* Benzodiazepine, long-acting

**Controlled substance schedule IV**

**Do not confuse:** Librium/Librax

**ACTION:** Potentiates the actions of GABA, an inhibitory neurotransmitter, especially in the limbic system, reticular formation, which depresses the CNS

**Therapeutic outcome:** Decreased anxiety, successful alcohol withdrawal, relaxation

**USES:** Short-term management of anxiety, acute alcohol withdrawal, preoperative relaxation

## CONTRAINDICATIONS

Pregnancy, breastfeeding, child <6 yr, hypersensitivity to benzodiazepines, closed-angle glaucoma, psychosis

**Precautions:** Geriatric, debilitated, renal/hepatic disease, suicidal ideation, abrupt discontinuation, respiratory depression, Parkinson's disease, myasthenia gravis

## DOSAGE AND ROUTES

### Mild anxiety

**Adult:** PO 5-10 mg tid-qid

**Geriatric:** PO 5 mg bid initially, increase as needed

**Child >6 yr:** PO 5 mg bid-qid, max 10 mg bid-tid

### Severe anxiety

**Adult:** PO 20-25 mg tid-qid

### Preoperatively

**Adult:** PO 5-10 mg tid-qid on day before surgery

### Alcohol withdrawal

**Adult:** PO 50-100 mg q4-6hr prn, max 300 mg/day

### Renal disease

**Adult:** PO CCr <10 ml/min give 50% dose

**Available forms:** Caps 5, 25 mg

### Implementation

**PO route**

- Give with food or milk for GI symptoms; do not open capsules; provide sugarless gum, hard candy, frequent sips of water for dry mouth

## ADVERSE EFFECTS

**CNS:** *Dizziness, drowsiness,* confusion, headache, anxiety, tremors, stimulation, fatigue, depression, insomnia, hallucinations

**CV:** *Orthostatic hypotension,* ECG changes, tachycardia, hypotension, edema

**EENT:** *Blurred vision,* tinnitus, mydriasis

**GI:** Constipation, dry mouth, nausea, vomiting, anorexia, diarrhea

**GU:** Irregular periods, decreased libido

**HEMA:** Agranulocytosis

**INTEG:** Rash, dermatitis, itching

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO); slow, erratic (IM) |
| **Distribution** | Widely distributed; crosses placenta, blood-brain barrier |
| **Metabolism** | Liver extensively |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 5-30 hr (increased in geriatric) |

### Pharmacodynamics

| | PO | IM | IV |
|---|---|---|---|
| **Onset** | 30 min | 15-30 min | 1-5 min |
| **Peak** | Within 2 hr | Unknown | Unknown |
| **Duration** | 4-6 hr | Unknown | Up to 1 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression

Cimetidine, disulfiram, FLUoxetine, isoniazid, ketoconazole, metoprolol, propranolol, valproic acid: increased action of chlordiazePOXIDE

Levodopa: decreased action of levodopa

### Drug classifications

CNS depressants: increased CNS depression

Contraceptives (oral): increased effect of chlordiazePOXIDE

CYP3A4 inhibitors (barbiturates, protease inhibitors, rifamycins): decreased effect of chlordiazePOXIDE

### Drug/lab test

Increased: LFTs
False increase: 17-OHCS
False positive: pregnancy test (some methods)

## NURSING CONSIDERATIONS

### Assessment

- Assess **anxiety reaction:** inability to sleep, apprehension, dread, foreboding, or uneasiness related to unidentified source of danger
- Assess for previous **product dependence** or tolerance; if product dependent or tolerant, amount of medication should be restricted
- Monitor B/P (with patient lying, standing), pulse; if systolic B/P drops 20 mm Hg, hold product, notify prescriber
- Monitor hepatic studies: AST, ALT, bilirubin, creatinine, LDH, alkaline phosphatase during long-term therapy
- **Monitor mental status:** mood, sensorium, affect, sleeping patterns, drowsiness, dizziness, suicidal tendencies, paradoxical reactions such as excitement, stimulation, acute rage
- Assess for pregnancy, product should not be used during pregnancy or breastfeeding

### Patient/family education

- Instruct patient that product may be taken with food; if dose is missed take as soon as remembered; do not double doses
- Tell patient to avoid OTC preparations unless approved by prescriber; to avoid alcohol ingestion or other psychotropic medications unless directed by a prescriber, tolerance occurs
- Caution patient to avoid driving and activities requiring alertness, since drowsiness may occur; until medication response is known, tell patient that drowsiness may worsen at beginning of treatment
- Instruct patient not to discontinue medication abruptly after long-term use; product should be tapered over 1 wk
- Caution patient to rise slowly or fainting may occur, especially in geriatric
- Advise patient that product should be avoided during pregnancy
- Advise patient to report immediately suicidal thoughts/behaviors

### Evaluation

**Positive therapeutic outcome**

- Increased well being
- Decreased anxiety, restlessness, sleeplessness, dread
- Successful alcohol withdrawal

## TREATMENT OF OVERDOSE:

Lavage, VS, supportive care

## chloroquine (Rx)

(klor′oh-kwin)
**Aralen**
*Func. class.:* Antimalarial
*Chem. class.:* Synthetic 4-aminoquinoline derivative

**ACTION:** Inhibits parasite replications, transcription of DNA to RNA by forming complexes with DNA of parasite

**Therapeutic outcome:** Decreased symptoms of malaria, amebiasis

**USES:** Malaria caused by *Plasmodium vivax, Plasmodium malariae, Plasmodium ovale, Plasmodium falciparum* (some strains), amebiasis

## CONTRAINDICATIONS

Hypersensitivity, retinal field changes

**Precautions:** Pregnancy, breastfeeding, children, blood dyscrasias, severe GI, neurologic disease, alcoholism, cardiac/hepatic disease, G6PD deficiency, psoriasis, eczema, seizures, preexisting auditory damage, infection, torsades de pointes, infection

## DOSAGE AND ROUTES

### Acute malaria attacks

**Adult: PO** 1000 mg (600 mg base), then 500 mg (300 mg base) in 6-8 hr, then 500 mg (300 mg base) q day × 2 days for a total of 2.5 g (1.5 g base) in 3 days

**Adult/adolescent of low body weight, child/infant: PO** 16.5 mg (10 mg base)/kg, max 600 mg base, then 8.3 mg (5 mg base)/kg max 300 mg base, 6 hr after 1st dose, then 8.3 mg (5 mg base)/kg, max 300 mg base 24 hr after 1st dose, then 8.3 mg (5 mg base)/kg max 300 mg base 36 hr after 1st dose

### Malaria prophylaxis (in areas with chloroquine–sensitive *P. falciparum)*

**Adult: PO** 500 mg (300 mg base) q wk on same day of each wk, starting 2 wk before travel and 8 wk after leaving

### Extraintestinal amebiasis

**Adult: PO** 1 g (600 mg base) q day × 2 days, then 500 mg (300 mg base) for ≥2-3 wk
**Child (unlabeled): PO** 16.6 mg (10 mg base)/kg (max 300 mg base) q day × 2-3wk

**Available forms:** Tabs 250 mg (150 mg base), 500 mg (300 mg base) phosphate

### Implementation

**PO route**

- Give with meals to decrease GI symptoms; better to take on empty stomach 1 hr before or 2 hr after meals
- Give antiemetic if vomiting occurs
- Give after C&S is completed; monthly to detect resistance

**IM route**

- Give IM after aspirating to prevent inj into bloodstream
- Store in tight, light-resistant container at room temp; keep inj in cool environment

**Additive compatibility:** Promethazine

## ADVERSE EFFECTS

**CNS:** Headache, stimulation, fatigue, seizure, psychosis, hallucinations, insomnia
**CV:** Hypotension, heart block, asystole with syncope, ECG changes, cardiomyopathy
**EENT:** *Blurred vision, corneal changes, retinal changes, difficulty focusing,* tinnitus, vertigo, deafness, photophobia, corneal edema
**GI:** *Nausea, vomiting, anorexia,* diarrhea, cramps
**HEMA:** Thrombocytopenia, agranulocytosis, hemolytic anemia, leukopenia
**INTEG:** Pruritus, pigmentary changes, skin eruptions, lichen planus–like eruptions, eczema, exfoliative dermatitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, feces |
| **Half-life** | 3-5 days |

### Pharmacodynamics

| | PO | IM |
|---|---|---|
| **Onset** | Rapid | Rapid |
| **Peak** | 1-3 hr | 30 min |
| **Duration** | 6-8 hr | Unknown |

## INTERACTIONS

### Individual drugs

Ampicillin, rabies vaccine (ID): decreased effects
Cimetidine: decreased oral clearance, metabolism
Kaolin: decreased absorption
Magnesium: decreased action of chloroquine

### Drug classifications

CYP2D6 inhibitors (amiodarone, chlorpheniramine, FLUoxetine, haloperidol, ritonavir, PAROxetine, terbinafine, ticlopidine), CYP3A4 inhibitors (clarithromycin, dilTIAZem, doxycycline, erythromycin, itraconazole, ketoconazole, verapamil): increased effects
Antacids (aluminum): decreased absorption
Class IA, III antidysrhythmics: increased QT prolongation, torsades de pointes

### Drug/lab test

Decreased: Hgb, platelets, WBC

## NURSING CONSIDERATIONS

### Assessment

- **Assess for infection:** resistance is common, not to be used for *P. falciparum* acquired in areas of resistance or where prophylaxis has failed
- Monitor **ECG,** baseline and periodically during therapy; watch for depression of T waves, widening of QRS complex
- **Assess for allergic reactions:** pruritus, rash, urticaria
- Assess for **ototoxicity:** tinnitus, vertigo, change in hearing; audiometric testing should be done before, after treatment
- Assess for **blood dyscrasias:** malaise, fever, bruising, bleeding (rare)
- Assess mental status often: affect, mood, behavioral changes; psychosis may occur
- **Assess for toxicity:** blurring vision, difficulty focusing, headache, dizziness, decreased knee and ankle reflexes, product should be discontinued immediately
- Screen for Genetic Warning G6PD deficiency, identify risk of hemolysis
- **Pregnancy/breastfeeding:** Avoid use in pregnancy except if suppression of malaria is needed and benefit outweighs fetal risk, do not use in breastfeeding

### Patient/family education

- Advise patient that compliance with dosage schedule, duration is necessary
- Instruct patient that scheduled appointments must be kept or relapse may occur
- Caution patient to avoid alcohol while taking product
- Instruct diabetic to use blood glucose monitor to obtain correct result
- Teach patient to report weakness, fatigue, loss of appetite, nausea, vomiting, yellowing of skin or eyes, tingling/numbness of hands/feet
- Advise patient that urine may turn rust brown color
- Instruct patient to use sunglasses in bright sunlight to prevent photophobia
- Keep away from pets, children; overdose is fatal

### Evaluation

**Positive therapeutic outcome**

- Decreased symptoms of malaria

## TREATMENT OF OVERDOSE:
Induce vomiting, gastric lavage, administer barbiturate (ultrashort-acting), vasopressor; tracheostomy may be necessary

## chlorproMAZINE (Rx)
(klor-proe′ma-zeen)
*Func. class.:* Antipsychotic/neuroleptic/antiemetic
*Chem. class.:* Phenothiazine, aliphatic

**Do not confuse:** chlorproMAZINE/chlorproPAMIDE/chlordiazePOXIDE

**ACTION:** Depresses cerebral cortex, hypothalamus, limbic system, which control activity, aggression; blocks neurotransmission produced by DOPamine at synapse; exhibits a strong α-adrenergic, anticholinergic blocking action; mechanism for antipsychotic effects is unclear

**Therapeutic outcome:** Decreased signs and symptoms of psychosis; control of nausea, vomiting, intractable hiccups, decreased anxiety preoperatively

**USES:** Psychotic disorders, Tourette's syndrome, mania, schizophrenia, anxiety, intractable hiccups (adults), nausea, vomiting, preoperative relaxation, acute intermittent porphyria, behavioral problems in children, nonpsychotic patients with dementia

**Unlabeled uses:** Vascular headache

## CONTRAINDICATIONS
Hypersensitivity, circulatory collapse, liver damage, cerebral arteriosclerosis, coronary disease, coma, child <6 mo

**Precautions:** Pregnancy, breastfeeding, geriatric, seizure disorders, hypertension, hepatic/cardiac disease, prostate enlargement, pulmonary/Parkinson's disease, severe hypo/hypertension, blood dyscrasias, brain damage, bone marrow depression, alcohol and barbiturate withdrawal, closed-angle glaucoma

**BLACK BOX WARNING:** Dementia; increased mortality in elderly patients with dementia-related psychosis

## DOSAGE AND ROUTES
### Psychosis
**Adult:** PO 10-50 mg q1-4hr initially, then increase up to 2 g/day if necessary; IM 10-50 mg q1-4hr, usual dose 300-800 mg/day
**Geriatric:** PO 10-25 mg daily-bid, increased by 10-25 mg/day q4-7day, max 800 mg/day
**Child >6 mo:** PO 0.55 mg/kg q4-6hr; IM 0.5 mg/kg q6-8hr

### Nausea and vomiting
**Adult:** PO 10-25 mg q4-6hr prn; IM 25-50 mg q3hr prn, then 25-50 mg q6-8hr PRN if no hypotension; max 400 mg/day; **IV** 25-50 mg daily-qid
**Child ≥6 mo:** PO 0.55 mg/kg q4-6hr; IM q6-8hr; IM ≤5 yr or ≤22.7 kg 40 mg; max IM 5-10 yr or 22.7-45.5 kg 75 mg

### Intractable hiccups/acute intermittent porphyria
**Adult:** PO 25-50 mg tid-qid; IM 25-50 mg (used only if PO dose does not work); **IV** 25-50 mg in 500-1000 ml saline (only for severe hiccups)

**Available forms:** Tabs 10, 25, 50, 100; inj 25 mg/ml

### Implementation
**PO route**
- Periodically attempt dosage reduction in patients with behavioral problems
- Give with full glass of water, milk; or give with food to decrease GI upset
- Store in tight, light-resistant container, oral sol in amber bottle

**Syrup:** Use calibrated measuring device, do not spill on skin or clothes

**IM route**
- Store in tight, light-resistant container
- Use gloves to prepare product; if product touches skin, wash with soap and water to prevent contact dermatitis
- Inject in deep muscle mass; do not give SUBCUT; may be diluted with 0.9% NaCl, 2%, patient procaine as prescribed; do not administer sol with a precipitate
- Remain lying down after IM inj for at least 30 min

**Rectal route**
- Give after placing in refrigerator for 30 min if too soft to insert; this route is used for nausea, vomiting, hiccups
- Avoid skin contact with injection solution; may cause contact dermatitis

**IV route (surgery only)**
**Direct IV**
- Give by direct **IV** by diluting with 0.9% NaCl to a concentration of 1 mg/1 ml; administer at a rate of 1 mg/2 min, never give undiluted

**Intermittent IV infusion**
- Give by intermittent IV infusion diluting 50 mg/500-1000 ml of $D_5W$, $D_{10}W$, 0.9% NaCl, 0.45% NaCl, LR, Ringer's over ½ hr or combinations (used for intractable hiccups)

**Y-site compatibilities:** Alfentanil, amikacin, amphotericin B lipid complex, amsacrine, anidulafungin, ascorbic acid injection, atenolol, atracurium, atropine, benztropine, bleomycin sulfate, buprenorphine, butorphanol, calcium

chloride/gluconate, caspofungin, cimetidine, cisatracurium, CISplatin, cladribine, codeine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexmedetomidine, digoxin, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doxacurium, DOXOrubicin, DOXOrubicin liposomal, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, isoproterenol, labetalol, levofloxacin, lidocaine, LORazepam, LR, magnesium sulfate, mannitol, mechlorethamine, meperidine, methicillin, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, miconazole, midazolam, milrinone, minocycline, mitoXANtrone, morphine, multiple vitamins injection, mycophenolate mofetil, nafcillin, nalbuphine, naloxone, netilmicin, nitroglycerin, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, palonosetron, pamidronate, pancuronium, papaverine, penicillin G potassium, pentamidine, pentazocine, phytonadione, polymyxin B, potassium chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine sulfate, pyridoxine, quiNIDine, quinupristin-dalfopristin, raNITIdine, Ringer's injection, ritodrine, riTUXimab, rocuronium, sodium acetate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, tirofiban, TNA, tolazoline, TPN, trimetaphan, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, vitamin B complex with C, voriconazole, zoledronic acid

## ADVERSE EFFECTS

**CNS:** Neuroleptic malignant syndrome, dizziness, *extrapyramidal symptoms: pseudoparkinsonism, akathisia, dystonia, tardive dyskinesia,* seizures, *headache*

**CV:** *Orthostatic hypotension,* hypertension, cardiac arrest, ECG changes, tachycardia

**EENT:** Blurred vision, glaucoma, dry eyes

**ENDO:** SIADH

**GI:** *Dry mouth, nausea, vomiting, anorexia, constipation,* diarrhea, cholestatic jaundice, weight gain

**GU:** Urinary retention, enuresis, impotence, amenorrhea, gynecomastia, breast engorgement

**HEMA:** Anemia, leukopenia, leukocytosis, agranulocytosis

**INTEG:** *Rash,* photosensitivity, dermatitis

**RESP:** Laryngospasm, dyspnea, respiratory depression

**SYST:** Death in geriatric patients with dementia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Variable (PO); well absorbed (IM) |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Liver, GI mucosa extensively |
| **Excretion** | Kidneys |
| **Half-life** | 23-37 hr |

### Pharmacodynamics

| | PO | RECT | IM | IV |
|---|---|---|---|---|
| **Onset** | ½-1 hr | 12 hr | Unknown | Rapid |
| **Peak** | Unknown | Unknown | Unknown | Unknown |
| **Duration** | 4-6 hr* | 3-4 hr | 4-8 hr | Unknown |

*Duration PO ext rel is 10-12 hr.

## INTERACTIONS

### Individual drugs

Alcohol: increased effects of both products, oversedation
Aluminum hydroxide, magnesium hydroxide, cimetidine: decreased absorption
Bromocriptine, levodopa: decreased antiparkinsonian activity
EPINEPHrine: increased toxicity
Lithium: decreased chlorproMAZINE levels
Valproic acid: increased valproic acid level
Warfarin: decreased anticoagulant effect

### Drug classifications

Antacids: decreased absorption
Anticholinergics, antidepressants, antiparkinsonian agents: increased anticholinergic effects
Anticonvulsants: decreased seizure threshold
Antidepressants, antihistamines, barbiturate anesthetics, opioids, sedative/hypnotics, MAOIs: increased CNS depression
Antithyroid agents: increased agranulocytosis
Barbiturates: decreased serum chlorproMAZINE
β-Adrenergic blockers: increased effect of both products

### Drug/herb

Increased: CNS depression: kava, chamomile, hops, valerian
Increased: Anticholinergic effect: jimson weed, scopolia

### Drug/lab test

Increased: liver function tests
Decreased: WBC, platelets, Hgb/Hct
False positive: pregnancy tests, PKU
False negative: urinary steroids, 17-OHCS

## NURSING CONSIDERATIONS

### Assessment

**Beers:** Avoid in older adults except in schizophrenia, bipolar disorder, or short-term use as antiemetic in chemotherapy, increased risk for stroke and greater rate of cognitive decline and mortality in dementia

- Assess mental status: AIMS assessment, orientation, mood, behavior, presence of hallucinations, and type before initial administration and monthly; this product should significantly reduce psychotic behavior
- Assess any potentially reversible cause of behavior problems in geriatric before, during therapy
- Monitor I&O ratio; palpate bladder if low urinary output occurs, especially in geriatric; urinalysis recommended before, during prolonged therapy; monitor B/P, pulse lying, sitting, standing
- Monitor bilirubin, CBC, liver function studies, ocular exam; agranulocytosis, glaucoma, cholestatic jaundice may occur
- Assess respirations q4hr during initial treatment; establish baseline before starting treatment; report drops of 30 mm Hg; obtain baseline ECG, Q-wave, and T-wave changes
- Check for dizziness, faintness, palpitations, tachycardia on rising; severe orthostatic hypotension is common
- **Identify for neuroleptic malignant syndrome:** hyperpyrexia, muscle rigidity, increased CPK, altered mental status; product should be discontinued
- Assess for **EPS** including akathisia (inability to sit still, no pattern to movements), tardive dyskinesia (bizarre movements of the jaw, mouth, tongue, extremities), pseudoparkinsonism (rigidity, tremors, pill rolling, shuffling gate); an antiparkinsonian product should be prescribed
- Assess for constipation, urinary retention daily; if these occur, increase bulk, water in diet
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, excreted in breast milk, discontinue breastfeeding or product

### Patient/family education

- Teach patient to use good oral hygiene; frequent rinsing of mouth, sugarless gum, candy, or ice chips for dry mouth
- Caution patient to avoid hazardous activities until product response is determined; dizziness, blurred vision may occur
- Inform patient that orthostatic hypotension occurs often and to rise from sitting or lying position gradually, to remain lying down after IM inj for at least 30 min; tell patient to avoid hot tubs, hot showers, tub baths, since hypotension may occur; tell patient that in hot weather heat stroke may occur; take extra precautions to stay cool
- Advise patient to avoid abrupt withdrawal of this product, or extrapyramidal symptoms may result; product should be withdrawn slowly
- Teach patient to avoid OTC preparations (cough, hay fever, cold) unless approved by prescriber, since serious product interactions may occur; avoid use with alcohol, CNS depressants, since increased drowsiness may occur
- Caution patient to use sunscreen and sunglasses to prevent burns
- Teach patient about extrapyramidal symptoms and necessity of meticulous oral hygiene, since oral candidiasis may occur
- Instruct patient to take antacids 2 hr before or after taking this product
- Instruct patient to report sore throat, malaise, fever, bleeding, mouth sores; if these occur, CBC should be drawn and product discontinued
- Teach that urine may turn pink or reddish-brown
- Teach patient to use contraceptive measures

### Evaluation

**Positive therapeutic outcome**

- Decrease in emotional excitement, hallucinations, delusions, paranoia
- Reorganization of patterns of thought, speech
- Increase in target behaviors

## TREATMENT OF OVERDOSE:

Lavage if orally ingested; provide airway, *do not induce vomiting or use EPINEPHrine*

## cholecalciferol

*See vitamin D*

## cholestyramine (Rx)

(koe-less-tear'a-meen)

**Prevalite, Questran, Questran Light**

*Func. class.:* Antilipemic

*Chem. class.:* Bile acid sequestrant

**Do not confuse:** Questran/Quarzan

**ACTION:** Adsorbs, combines with bile acids to form an insoluble complex that is excreted through feces; loss of bile acids lowers LDL, cholesterol levels

**Therapeutic outcome:** Decreasing cholesterol levels and low-density lipoproteins, decreased pruritus

**USES:** Primary hypercholesterolemia (especially type IIa/IIb hyperlipoproteinemia), pruritus associated with biliary obstruction

**Unlabeled uses:** Diarrhea caused by excess bile acid

## CONTRAINDICATIONS

Hypersensitivity; complete biliary obstruction; hyperlipidemia III, IV, V

**Precautions:** Pregnancy, breastfeeding, children, PKU, renal disease, coagulopathy

## DOSAGE AND ROUTES

**Adult:** PO 4 g daily-bid, max 24 g/day
**Child:** PO 240 mg/kg/day in 3 divided doses; administer with food or drink, max 8 g/day, titrated up over several weeks to decrease GI effects

**Available forms:** Powder for susp 4 g/cholestyramine/packet or scoop

### Implementation

- Give product daily-bid, at bedtime; give all other medications 1 hr before cholestyramine or 4-6 hr after cholestyramine to avoid poor absorption; do not take dry; mix product with applesauce or stir into beverage (2-6 oz); let stand for 2 min; do not mix with carbonated beverages; avoid inhaling powder, avoid GI tube administration, take with food
- Provide supplemental doses of vit A, D, E, K if levels are low
- Doses are expressed in anhydrous cholestyramine resin; amount of resin varies with each product

## ADVERSE EFFECTS

**CNS:** Headache, dizziness, drowsiness, vertigo, tinnitus, anxiety
**GI:** *Constipation, abdominal pain, nausea,* fecal impaction, hemorrhoids, flatulence, vomiting, steatorrhea, peptic ulcer
**HEMA:** Bleeding, increased pro-time
**INTEG:** Rash, irritation of perianal area, tongue, skin
**META:** Decreased vit A, D, K, red cell folate content, hyperchloremic acidosis
**MS:** Muscle, joint pain

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Not absorbed |
| **Distribution** | Not distributed |
| **Metabolism** | Not metabolized; LDL lowered in 4-7 days, serum cholesterol lowered in 1 mo |
| **Excretion** | Binds with bile acids, feces |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 24-48 hr |
| **Peak** | 1-3 wk |
| **Duration** | 2-4 wk |

## INTERACTIONS

### Individual drugs

Acetaminophen, amiodarone, clofibrate, gemfibrozil, glipiZIDE, iron, oral vancomycin, penicillin G, propranolol, thyroid hormones, warfarin: decreased absorption of each specific product

### Drug classifications

Cardiac glycosides, corticosteroids, tetracyclines, thiazides, vit A, D, E, K: decreased absorption

### Drug/lab test

Increased: AST, ALT, alkaline phosphatase
Decreased: Na, K

## NURSING CONSIDERATIONS

### Assessment

- Assess nutrition: fat, protein, carbohydrates, nutritional analysis should be completed by dietitian
- Assess skin integrity after patient has been receiving product; itching, pruritus often occur from bile deposits on skin
- Monitor cardiac glycoside level if both products are being administered; cardiac glycoside levels will be decreased, may need to adjust dose of cardiac glycoside, if this product is increased or decreased
- **Hypercholesterolemia:** Monitor for signs of vit A, D, E, K deficiency; fasting LDL, HDL, total cholesterol, triglyceride levels, electrolytes if on extended therapy, diet history
- Monitor bowel pattern daily; increase bulk, water in diet if constipation develops
- **Pruritus:** Assess for itching
- **Pregnancy/breastfeeding:** No well-controlled studies, may decrease vitamin absorption (fat soluble), only use if benefits outweigh fetal risk, cautious use in breastfeeding

### Patient/family education

- **Teach patient symptoms of hypoprothrombinemia:** bleeding mucous membranes, dark tarry stools, hematuria, petechiae; report immediately
- Teach patient to take with food, never use dry
- Teach patient importance of compliance
- Teach patient that risk factors should be decreased: high-fat diet, smoking, alcohol consumption, absence of exercise
- Have patient mix product with 6 oz of milk, water, fruit juice; do not mix with carbonated beverages; rinse glass to make sure all medication is taken or may mix product in applesauce; allow to stand for 2 min before mixing

### Evaluation

**Positive therapeutic outcome**

- Decreased cholesterol level (hyperlipidemia)
- Decreased diarrhea, pruritus (excess bile acids)

## cidofovir (Rx)

(si-doh-foh'veer)

**Vistide**

*Func. class.:* Antiviral

*Chem. class.:* Nucleotide analog

**ACTION:** Suppresses cytomegalovirus (CMV) replication by selective inhibition of viral DNA synthesis

**Therapeutic outcome:** Decreased symptoms of CMV

**USES:** CMV retinitis in patients with HIV, used with probenecid

## CONTRAINDICATIONS

Hypersensitivity to this product or probenecid; sulfa products, direct intraocular injection, proteinuria, renal disease/failure

**Precautions:** Pregnancy, breastfeeding, children <6 mo, geriatric, preexisting cytopenias, renal function impairment, platelet count <25,000/mm$^3$, dehydration

**BLACK BOX WARNING:** Neutropenia, infertility, secondary malignancy, pregnancy nephrotoxicity

## DOSAGE AND ROUTES

**Adult: IV** CCr Infusion: Induction: 5 mg/kg over 1 hr qwk × 2 wk, maintenance: 5 mg/kg over 1 hr every other wk, give with probenecid

### Renal dose

**Adult:** IV CCr ≤55 ml/min, do not use; SCr increase of 0.3-0.4 mg/dl above baseline, decrease dose to 3 mg/kg; SCr increase of ≥0.5 mg/dl above baseline or ≥2+ proteinuria, discontinue

**Available forms:** Inj 75 mg/ml

### Implementation

- Allow to warm to room temperature
- If product comes in contact with skin, wash with soap and water immediately
- If zidovudine is used, reduce dose to 50% in cidofovir treatment days

**Intermittent IV infusion route**

- **Dilute** in 100 ml 0.9% NaCl sol before administration; give probenecid PO 2 g 3 hr before the cidofovir INF and 1 g at 2 and 8 hr after ending the cidofovir INF; **give** 1 L of 0.9% NaCl sol **IV** with each INF of cidofovir, **give** saline INF over 1-2 hr period immediately before cidofovir; patient should be given a second L if the patient can tolerate the fluid load (second L given at time of cidofovir or immediately afterward and should be given over a 1-3 hr period)

**BLACK BOX WARNING:** Use cytotoxic handling procedures

- **Administer** after diluting in 100 ml of 0.9% NaCl
- **Give** slowly; do not give by BOL **IV, IV,** SUBCUT inj
- **Use** diluted sol within 24 hr, do not refrigerate or freeze; do not use sol with particulate matter or discoloration
- Do not admix

## ADVERSE EFFECTS

**CNS:** *Fever, chills,* coma, confusion, abnormal thought, *dizziness,* bizarre dreams, *headache,* psychosis, tremors, somnolence, paresthesia, *amnesia, anxiety, insomnia,* seizures

**CV:** Dysrhythmias, hypo/hypertension

**EENT:** Retinal detachment in CMV retinitis

**GI:** Abnormal liver function tests, *nausea, vomiting, anorexia, diarrhea,* abdominal pain, hemorrhage

**GU:** Hematuria, increased creatinine, BUN, nephrotoxicity

**HEMA:** Granulocytopenia, thrombocytopenia, irreversible neutropenia, anemia, eosinophilia

**INTEG:** *Rash, alopecia, pruritus, acne,* urticaria, pain at inj site, phlebitis

**RESP:** Dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Terminal 2.6 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

**BLACK BOX WARNING:** Amphotericin B, foscarnet, pentamidine **IV:** increased nephrotoxicity; wait 7 days after use to begin cidofovir

### Drug/lab test

Increase: AST/ALT, alkaline phosphatase, glucose, cholesterol, BUN, creatinine, urine protein

Decrease: Neutrophils, platelets, calcium, potassium

### Drug classifications

Aminoglycosides, NSAIDs, salicylates: increased nephrotoxicity; wait 7 days after use to begin cidofovir

## NURSING CONSIDERATIONS

### Assessment

• Obtain culture before treatment is initiated; cultures of blood, urine, and throat may all be taken; CMV is not confirmed by this method; the diagnosis is made by an ophthalmic exam

**BLACK BOX WARNING:** Monitor renal, liver function, increased hematopoietic studies and BUN; serum creatinine, AST, ALT, creatinine, CCr, A-G ratio, baseline and drip treatment, blood counts should be done q2wk; watch for decreasing granulocytes, Hgb; if low, therapy may have to be discontinued and restarted after hematologic recovery; blood transfusions may be required, renal failure/Fanconi syndrome can also occur

• Assess for GI symptoms: severe nausea, vomiting, diarrhea; severe symptoms may necessitate discontinuing product

• Assess electrolytes and minerals: calcium, phosphorous, magnesium, sodium, potassium; watch closely for tetany during first administration

• **Assess for symptoms of blood dyscrasias (anemia, granulocytopenia); bruising, fatigue, bleeding, poor healing; assess for leukopenia, neutropenia, thrombocytopenia:** WBCs, platelets q2day during 2 × /day dosing and qwk thereafter; check for leukopenias, with daily WBC count in patients with prior leukopenia, with other nucleoside analogs, or for whom leukopenia counts are $<1000$ cells/mm$^3$ at start of treatment

• Assess allergic reactions: flushing, rash, urticaria, pruritus

• Monitor serum creatinine or CCr at least q2wk; give only to those with creatinine levels $\leq 1.5$ mg/dl, CCr $>55$ ml/min, urine protein $<100$ mg/dl

• **Pregnancy/breastfeeding:** May cause fetal harm, use only if benefits outweigh fetal risk, do not use in breastfeeding

### Patient/family education

**BLACK BOX WARNING:** Advise to notify prescriber if sore throat, swollen lymph nodes, malaise, fever occur; may indicate other infections

• Advise to report perioral tingling, numbness in extremities, and paresthesias; report rash immediately, mental/vision changes, urinary problems, abnormal bleeding

• Teach that serious product interactions may occur if OTC products are ingested; check first with prescriber

• Teach that product is not a cure, but will control symptoms

• Advise that regular ophthalmic exams, renal studies must be continued

• Advise that major toxicities may necessitate discontinuing product

**BLACK BOX WARNING:** Advise to use contraception during treatment and that infertility may occur; men should use barrier contraception for 90 days after treatment

### Evaluation

**Positive therapeutic outcome**

• Decreased symptoms of CMV

## TREATMENT OF OVERDOSE:

Discontinue product; use hemodialysis, and increase hydration

## cilastatin

*See imipenem/cilastatin*

**⚠ HIGH ALERT**

## cilostazol (Rx)

(sih-los'tah-zol)

**Pletal**

*Func. class.:* Platelet aggregation inhibitor

*Chem. class.:* Quinolinone derivative

**Do not confuse:** Pletal/Plendil

**ACTION:** Multifactorial effects (antithrombotic, antiplatelet vasodilation)

**Therapeutic outcome:** Increased walking distance

**USES:** Intermittent claudication associated with PVD

## CONTRAINDICATIONS

Hypersensitivity, acute MI, active bleeding conditions, hemostatic conditions

**BLACK BOX WARNING:** HF

**Precautions:** Pregnancy, breastfeeding, children, geriatric, past liver disease, renal/cardiac disease, increased bleeding risk, low platelet count, platelet dysfunction, smoking

## DOSAGE AND ROUTES

**Adult:** PO 100 mg bid taken ≥30 min before or 2 hr after breakfast and dinner or 50 mg bid, if using products that inhibit CYP3A4 and CYP2C19; 12 wk of treatment may be needed for beneficial effect

**Available forms:** Tabs 50, 100 mg

### Implementation

• Give bid ≥1 hr before or 2 hr after meals with a full glass of water; do not give with grapefruit juice

## ADVERSE EFFECTS

**CNS:** *Dizziness, headache*
**CV:** *Palpitations, tachycardia,* nodal dysrhythmia, postural hypotension, chest pain
**EENT:** Blindness, diplopia, ear pain, tinnitus, retinal hemorrhage
**GI:** *Nausea, vomiting, diarrhea, GI discomfort,* colitis, cholelithiasis, ulcer, esophagitis, gastritis, anorexia, *flatulence, dyspepsia*
**GU:** Cystitis, frequency, vaginitis, vaginal hemorrhage, hematuria
**HEMA:** Bleeding (epistaxis, hematuria, retinal hemorrhage, GI bleeding), thrombocytopenia, anemia, polycythemia; aplastic anemia
**INTEG:** *Rash,* urticaria, dry skin, Stevens-Johnson syndrome
**MISC:** *Back pain,* headache, *infection, myalgia, peripheral edema,* chills, fever, malaise, diabetes mellitus
**RESP:** *Cough, pharyngitis, rhinitis,* asthma, pneumonia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 95%-98% protein binding |
| **Metabolism** | Hepatic extensively by CYP450 enzymes (active metabolite) |
| **Excretion** | Urine (74%), feces (20%) |
| **Half-life** | 11-13 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Abciximab, eptifibatide, ticlopidine, tirofiban: increased bleeding tendencies
Clarithromycin, dilTIAZem, erythromycin, omeprazole, verapamil: increased cilostazol levels
Fluconazole, FLUoxetine, fluvoxaMINE, gemfibrozil, isoniazid, itraconazole, ketoconazole, omeprazole, voriconazole: may increase cilostazol levels; exercise caution when coadministering and reduce dose to 50 mg bid

**BLACK BOX WARNING:** Decrease: Survival rates: inamrirone, milrinone in those with heart failure class III, IV

### Drug classifications

Anticoagulants, NSAIDs, thrombolytics: may increase bleeding tendencies
CYP3A4 inducers: decreased cilostazol
Protease inhibitors, CYP3A4 inhibitors, CYP2C19 inhibitors: increased cilostazol levels

### Drug/food

Grapefruit juice: do not use; toxicity may occur
High-fat meals: increased cilostazol action; avoid giving with food

### Drug/herb

Feverfew, garlic, ginger, ginkgo biloba: decreased cilostazol action

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Assess for underlying CV disease since CV risk is great; for CV lesions with repeated oral use; do not use in heart failure of any severity for severe headache, signs of toxicity

• **Beers:** Avoid in older adults, may promote fluid retention and/or exacerbate heart failure
• Assess for CV lesions with repeated oral administration
• Assess for HF
• Monitor blood studies: CBC, Hct, Hgb, pro-time if patient is on long-term therapy; thrombocytopenia, neutropenia may occur
• **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, excreted in breast milk, discontinue breastfeeding or discontinue product

### Patient/family education

• Teach patient to avoid hazardous activities until effect is known
• Advise patient to report any unusual bleeding to prescriber
• Caution patient to report side effects such as diarrhea, skin rashes, subcutaneous bleeding
• Teach patient that effects may take 2-4 wk, treatment of up to 12 wk may be required for necessary effect
• Teach patients with HF about potential risks
• Advise patient to take ≥1 hr before or 2 hr after meals
• Advise patient that reading patient package insert is necessary
• Advise patient to discontinue tobacco use, not to drink grapefruit juice

• Advise that there are many drug and herb interactions; obtain approval by prescriber before use

### Evaluation
**Positive therapeutic outcome**
• Increased walking distance and duration
• Decreased pain

## cimetidine (OTC, Rx)
(sye-met'i-deen)
**Gaviscon Prevent 🍁, Nu-Cimet 🍁, Tagamet, Tagamet HB**
*Func. class.:* $H_2$-receptor antagonist
*Chem. class.:* Imidazole derivative

**ACTION:** Inhibits histamine at $H_2$-receptor site in the gastric parietal cells, which inhibits gastric acid secretion

**Therapeutic outcome:** Healing of duodenal or gastric ulcers; prevention of duodenal ulcers; decreases symptoms of gastroesophageal reflux disease (GERD) and Zollinger-Ellison syndrome

**USES:** Short-term treatment of duodenal and gastric ulcers and maintenance; management of GERD, Zollinger-Ellison syndrome; prevention of upper GI bleeding; prevent, relieve heartburn, acid indigestion, upper GI bleeding

**Unlabeled uses:** Prevention of aspiration pneumonitis, stress ulcers

## CONTRAINDICATIONS
Hypersensitivity to this product, $H_2$ blockers, benzyl alcohol

**Precautions:** Pregnancy, breastfeeding, child <16 yr, geriatric, organic brain syndrome, renal/hepatic disease

## DOSAGE AND ROUTES
### Treatment of active ulcers
**Adult/adolescent ≥16 yr:** PO 300 mg qid with meals, at bedtime × 8-12 wk or 400 mg bid, 800 mg at bedtime; after 8 wk give at bedtime dose only; **IV** BOL 300 mg/20 ml 0.9% NaCl over 1-2 min q6hr; **IV** INF 300 mg/50 ml $D_5W$ over 15-20 min; IM 300 mg q6hr, max 2400 mg
**Child:** PO 20-40 mg/kg/day, divided q6hr IM/**IV** 5-10 mg/kg q6-8hr

### Prophylaxis of duodenal ulcer
**Adult and child >16 yr:** PO 400 mg at bedtime or 300 mg bid

### GERD
**Adult:** PO 800-1600 mg/day in divided doses × ≤12 wk

### Hypersecretory conditions (Zollinger-Ellison syndrome)
**Adult:** PO/IM/**IV** 300-600 mg q6hr; may increase to 12 g/day if needed; OTC use up to 200 mg daily or bid, max 2 ×/wk

### Upper GI bleeding prophylaxis
**Adult:** **IV** 50 mg/hr; lowered in renal disease

### Heartburn
**Adult/child ≥12 yr:** PO 200 mg Tagamet HB up to bid, may use prior to eating, max 400 mg/day, max daily use up to 2 wk

### Renal dose
**Adult:** PO/IV CCr <30 ml/min 300 mg q12hr

**Available forms:** Tabs 200, 300, 400, 800 mg; liquid 300 mg/5 ml; inj 300 mg/2 ml, 300 mg/50 ml 0.9% NaCl

### Implementation
**PO route**
• Give with meals for lengthened product effect; antacids 1 hr before or 1 hr after cimetidine
**IM route**
• May give undiluted
• Give at end of dialysis
• Inject deeply into large muscle mass, aspirate
**IV route**
• Give by **direct IV** after diluting 300 mg/20 ml of 0.9% NaCl for inj; give over ≥5 min
• Give **intermittent IV** by diluting 300 mg/50 ml of $D_5W$; run over ≥30 min
• Give by **cont inf** after using total daily dose (900 mg) diluted in 100-1000 ml $D_5W$ given over 24 hr
• Store diluted sol at room temperature up to 48 hr

**Y-site incompatibilities:** Amsacrine

**Y-site compatibilities:** Acetaminophen, acyclovir, alfentanil, amifostine, amikacin, aminocaproic acid, aminophylline, amphotericin B lipid complex/liposome, anakinra, anidulafungin, ascorbic acid injection, atenolol, atracurium, atropine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, cefamandole, ceFAZolin, cefmetazole, cefonicid, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, cephalothin, cephapirin, chlorproMAZINE, cisatracurium, CISplatin, cladribine, clarithromycin, clindamycin, codeine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin,

dexamethasone, dexmedetomidine, digoxin, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doripenem, doxacurium, doxapram, DOXOrubicin, DOXOrubicin liposome, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, epoetin alfa, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, fluorouracil, folic acid, foscarnet, gallium, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, irinotecan, isoproterenol, ketorolac, labetalol, levofloxacin, lidocaine, linezolid, LORazepan, LR, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, metaraminol, meropenem, methicillin, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, mezlocillin, miconazole, midazolam, milrinone, minocycline, mitoXANtrone, morphine, moxalactam, multiple vitamins injection, mycophenolate, nafcillin, nalbuphine, naloxone, nesiritide, netilmicin, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, pantoprazole, papaverine, PEMEtrexed, penicillin G sodium/potassium, pentamidine, pentazocine, phenylephrine, phytonadione, piperacillin, piperacillin/tazobactam, polymyxin B, potassium chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, pyridoxine, quiNIDine, quinupristin-dalfopristin, raNITIdine, remifentanil, Ringer's ritodrine, riTUXimab, rocuronium, sargramostim, sodium acetate/bicarbonate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA, tobramycin, tolazoline, topotecan, TPN, trastuzumab, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CNS:** *Confusion, headache,* depression, dizziness, anxiety, weakness, psychosis, tremors, seizures
**CV:** Bradycardia, tachycardia, dysrhythmias
**GI:** *Diarrhea,* abdominal cramps, paralytic ileus, *jaundice*
**GU:** Gynecomastia, galactorrhea, impotence, increase in BUN, creatinine
**HEMA:** Agranulocytosis, thrombocytopenia, neutropenia, aplastic anemia, increase in pro-time
**INTEG:** Urticaria, rash, alopecia, sweating, flushing, exfoliative dermatitis
**RESP:** Pneumonia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO, IM); completely absorbed (**IV**) |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Liver (30%) |
| **Excretion** | Kidneys, unchanged (70%); breast milk |
| **Half-life** | 1½-2 hr; increased in renal disease |

### Pharmacodynamics

| | PO | IM/IV |
|---|---|---|
| **Onset** | ½ hr | 10 min |
| **Peak** | 45-90 min | ½ hr |
| **Duration** | 4-5 hr | 4-5 hr |

## INTERACTIONS

### Individual drugs

CarBAMazepine, chloroquine, lidocaine, metroNIDAZOLE, moricizine, phenytoin, quiNIDine, quiNINE, valproic acid, warfarin: increased toxicity (CYP450 pathway)
Carmustine: increased bone marrow suppression
Itraconazole: decreased absorption of itraconazole
Ketoconazole: decreased absorption of ketoconazole
Sucralfate: decreased cimetidine absorption

### Drug classifications

Antacids: decreased absorption of cimetidine
Antidepressants (tricyclic), benzodiazepines, β-adrenergic blockers, calcium channel blockers, phenytoin, sulfonylureas, theophyllines: increased toxicity (CYP450 pathway)

### Drug/lab test

Increased: alkaline phosphatase, AST, creatinine, prolactin
False positive: Hemoccult, Gastroccult tests
False negative: TB skin tests

## NURSING CONSIDERATIONS

### Assessment

- **Ulcer symptoms:** Assess patient with ulcers or suspected ulcers: epigastric or abdominal pain, hematemesis, occult blood in stools, blood in gastric aspirate before and/or throughout treatment
- **Beers:** Avoid in older adults with or at high risk of delirium
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits

outweigh fetal risk, excreted in breast milk, avoid breastfeeding

### Patient/family education

- Advise patient that any gynecomastia or impotence that develops is reversible after treatment is discontinued
- Caution patient to avoid driving, other hazardous activities until stabilized on this medication; drowsiness or dizziness may occur
- Advise patient to avoid black pepper, caffeine, alcohol, harsh spices, extremes in temperature of food; tell patient to avoid OTC preparations: aspirin, cough, cold preparations; condition may worsen, OTC therapy is used for short term (2 wk)
- Advise patient that smoking decreases the effectiveness of the product; smoking cessation should be considered
- Teach patient to use increased fluids, bulk in diet to decrease constipation
- Teach patient that product must be continued for prescribed time to be effective and taken exactly as prescribed; doses are not to be doubled; to take missed dose when remembered up to 1 hr before next dose; if taking OTC, not to use maximum dose >2 wk, unless directed by prescriber
- Instruct patient to report bruising, fatigue, malaise; blood dyscrasias may occur
- Have patient report to prescriber immediately any diarrhea, black tarry stools, sore throat, dizziness, confusion, or delirium

### Evaluation

**Positive therapeutic outcome**

- Decreased pain in abdomen
- Healing of ulcers
- Absence of gastroesophageal reflux
- Gastric pH of ≥5

## cinacalcet (Rx)

(sin-a-kal′set)

**Sensipar**

*Func. class.:* Calcium receptor agonist
*Chem. class.:* Polypeptide hormone

**ACTION:** Directly lowers PTH levels by increasing sensitivity of calcium sensing receptors to extracellular calcium

**Therapeutic outcome:** Decreased symptoms of hypercalcemia

**USES:** Hypercalcemia in parathyroid carcinoma, secondary hyperparathyroidism in chronic kidney disease on dialysis, primary hyperparathyroidism

## CONTRAINDICATIONS

Hypersensitivity, hypocalcemia

**Precautions:** Pregnancy, breastfeeding, children, seizure disorders, hepatic disease

## DOSAGE AND ROUTES

### Parathyroid carcinoma

**Adult:** PO 30 mg bid, titrate q2-4wk, with sequential doses of 30 mg bid, 60 mg bid, 90 mg bid, 90 mg tid-qid to normalize calcium levels

### Secondary hyperparathyroidism

**Adult:** PO 30 mg daily, titrate no more frequently than 2-4 wks with sequential doses of 30, 60, 90, 120, 180 mg daily

**Available forms:** Tabs 30, 60, 90 mg

### Implementation

- Swallow tabs whole; do not break, crush, chew, or divide tabs
- Can be used alone or in combination with vit D sterols and/or phosphate binders
- Take with food or shortly after meal

**Secondary hyperthyroidism**

- Titrate q2-4wk to target iPTH consistent with National Kidney Foundation—Kidney Disease Outcomes Quality Initiative (NKF-K/DOQI) for chronic kidney disease patient on dialysis of 150-300 pg/ml; if iPTH drops below 150-300 pg/ml, reduce dose of cinacalcet and/or vit D sterols or discontinue treatment
- Store at <77° F (25° C)

## ADVERSE EFFECTS

**CNS:** Dizziness, asthenia, seizures, tetany, hallucinations, depression, headache
**CV:** Hypertension, dysrhythmia exacerbation
**GI:** Nausea, diarrhea, vomiting, anorexia
**MISC:** Access infection, noncardiac chest pain, hypocalcemia
**MS:** Myalgia, bone fractures

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 93%-97% bound to plasma |
| **Distribution** | Unknown |
| **Metabolism** | Proteins metabolized by CYP3A4, 2D6, 1A2 |
| **Excretion** | Renal (80% renal, 15% feces) |
| **Half-life** | 30-40 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Flecainide, thioridazine, vinBLAStine: increased levels of CYP2D6 inhibitors; adjustments may be necessary

### Drug classifications
Products metabolized by CYP3A4 inhibitors (erythromycin, itraconazole, ketoconazole): increased cinacalcet levels
Tricyclics: increased levels of CYP2D6 inhibitors)

### Drug/food
High-fat meal: increased action

## NURSING CONSIDERATIONS
### Assessment
• Assess for **hypocalcemia:** cramping, seizures, tetany, myalgia, paresthesia
• Monitor calcium, phosphorous within 1 wk and iPTH 1-4 wk after initiation or dosage adjustment when maintenance is established; measure calcium, phosphorus monthly; iPTH q1-3mo, target range 150-300 pg/ml for iPTH level; biochemical markers of bone formation/resorption, radiologic evidence of fracture; if calcium <8.4 mg/dl, do not start therapy, if calcium is 7.5-8.4 mg/dl give calcium-containing phosphate binders, vitamin D sterols to increase calcium, if calcium <7.5 mg/day or if symptoms of hypocalcemia continue and vitamin D cannot be increased, withhold product until calcium reaches 8.0 mg/dl, symptoms resolve, start product at next lowest dose
• **Renal disease (without dialysis):** These patients should not receive treatment with this product, high risk of hypocalcemia
• **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, pregnant patients should enroll in Amgen's Pregnancy Surveillance Program 800-772-6436, discontinue breastfeeding or products, excretion unknown

### Patient/family education
• Instruct patient to take with food or shortly after a meal, to take tabs whole, not to take any other meds, supplements without prescriber approval
• Instruct patient to immediately report cramping, seizures, muscle pain, tingling, tetany
• Liver studies in those with liver disease

### Evaluation
**Positive therapeutic outcome**
• Calcium levels 9-10 mg/dl, decreasing symptoms of hypercalcemia

## ciprofloxacin (Rx)
(sip-ro-floks'a-sin)
**Cipro, Cipro XR**
*Func. class.:* Antiinfectives, broad-spectrum
*Chem. class.:* Fluoroquinolone

**Do not confuse:** ciprofloxacin/cephalexin

**ACTION:** Interferes with conversion of intermediate DNA fragments into high-molecular-weight DNA in bacteria; DNA gyrase inhibitor

**Therapeutic outcome:** Bactericidal action against the following: gram-positive organisms *Staphylococcus epidermidis,* methicillin-resistant strains of *Staphylococcus aureus;* gram-negative organisms *Escherichia coli, Klebsiella* species, *Enterobacter, Salmonella, Proteus vulgaris, Pseudomonas aeruginosa, Serratia, Campylobacter jejuni*

**USES:** Adult urinary tract infections (including complicated); chronic bacterial prostatitis; acute sinusitis; infectious diarrhea; typhoid fever; complicated intraabdominal infections; nosocomial pneumonia; exposure to inhalation anthrax

## CONTRAINDICATIONS
Hypersensitivity to quinolones

**Precautions:** Pregnancy, breastfeeding, children, geriatric, renal disease, seizure disorder, stroke, CV disease, hepatic disease, QT prolongation, hypokalemia, colitis

**BLACK BOX WARNING:** Tendon pain/rupture, tendonitis, myasthenia gravis, neurotoxicity

## DOSAGE AND ROUTES
### Uncomplicated urinary tract infections
**Adult:** PO 250 mg q12hr × 3 days or XL 500 mg q24hr × 3 days

### Complicated/severe urinary tract infections
**Adult:** PO 500 mg q12hr or XL 1000 mg q24hr × 7-14 days; **IV** 400 mg q12hr

### Respiratory, bone, skin, joint infections (mild-moderate)
**Adult:** PO 500-750 mg q12hr × 7-14 days; **IV** 400 mg q12hr

### Nosocomial pneumonia
**Adult:** **IV** 400 mg q8hr × 10-14 days

### Intraabdominal infections, complicated
**Adult:** PO 500 mg q12hr × 7-14 days, **IV** 400 mg q12hr × 7-14 days, usually given with metroNIDAZOLE

### Acute sinusitis, mild/moderate
**Adult:** PO 500 mg q12hr × 10 days; **IV** 400 mg q12hr × 10 days

### Inhalational anthrax (postexposure)
**Adult:** PO 500 mg q12hr × 60 days; **IV** 400 mg q12hr × 60 days

**Child:** PO 15 mg/kg/dose q12hr × 60 days, max 500 mg/dose; **IV,** 10 mg/kg q12hr, max 400 mg/dose

### Infectious diarrhea
**Adult:** PO 500-750 mg q12hr × 5-7 days

### Chronic bacterial prostatitis
**Adult:** PO 500 mg q12hr × 28 days; **IV** 400 mg q12hr × 28 days

### Renal dose
**Adult:** PO CCr 30-50 ml/min PO 250-500 mg q12hr; CCr 5-29 ml/min PO 250-500 mg q18hr; IV 200-400 mg q18-24hr

**Available forms:** Tabs 100, 250, 500, 750 mg; ext rel tabs (XR) 500, 1000 mg; powder for oral susp 5%, 10%; inj 200 mg/20 ml, 400 mg/40 ml, 200 mg/100 ml $D_5$, 400 mg/200 ml $D_5$; oral susp 250, 500 mg/5 ml

### Implementation
Obtain C&S before use, may give first dose before results are received

**PO route**
- Give around the clock to maintain proper blood levels
- Administer 6 hr before or 2 hr after antacids, zinc, iron, calcium; use adequate fluids to prevent crystalluria
- Do not give oral sup by GI tube
- Limit intake of alkaline soda, products with milk, dairy products, alkaline antacids, sodium bicarbonate
- Ext rel and regular release are not interchangeable
- Do not add or stop products without prescriber's approval
- Use calibrated measuring device for suspension

**IV route**
- Check for irritation, extravasation, phlebitis daily
- For **intermittent inf,** dilute to 1-2 mg/ml of $D_5W$, 0.9% NaCl; give over 60 min; it will remain stable under refrigeration for 2 wk, diluted vials can be stored for 14 days at room temperature or in refrigerator, do not freeze

**Y-site incompatibilities:** Argatroban, arsenic, heparin, mezlocillin

## ADVERSE EFFECTS
**CNS:** *Headache,* dizziness, fatigue, insomnia, depression, *restlessness,* seizures, confusion, hallucinations
**GI:** *Nausea,* increased ALT, AST, flatulence, heartburn, *vomiting, diarrhea,* oral candidiasis, dysphagia, dry mouth, abdominal pain, pancreatitis
**GU:** Crystalluria, interstitial neuritis
**HEMA:** Bone marrow depression, agranulocytosis, eosinophilia
**INTEG:** *Rash,* pruritus, urticaria, photosensitivity, flushing, fever, chills, toxic epidermal necrolysis, injection site reactions
**MISC:** Anaphylaxis, Stevens-Johnson syndrome, visual impairment, QT prolongation, pseudotumor cerebri
**MS:** Tremor, arthralgia, tendon rupture

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (75%) (PO) |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver (15%) |
| **Excretion** | Kidneys (40%-50%) |
| **Half-life** | 4 hr; increased in renal disease |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | Rapid | Immediate |
| **Peak** | 4 hr | Infusion's end |

## INTERACTIONS
### Individual drugs
Alfuzosin, arsenic trioxide, astemizole, chloroquine, cloZAPine, cyclobenzaprine, dasatinib, dolasetron, droperidol, flecainide, haloperidol, lapatinib, levomethadyl, methadone, octreotide, ondansetron, paliperidone, palonosetron, pentamidine, probucol, propafenone, ranolazine, risperiDONE, sertindole, SUNItinib, tacrolimus, terfenadine, vardenafil, vorinostat, ziprasidone: increased QT prolongation; less likely than other quinolones
CYP1A2 inhibitors: increased levels of CYP1A2 inhibitors
Calcium, enteral feeding, iron, sucralfate, sevelamer, zinc sulfate: decreased ciprofloxacin absorption
CycloSPORINE: increased nephrotoxicity
Probenecid: increased blood levels of ciprofloxacin, increased toxicity
Theophylline: increased theophylline levels, monitor blood levels, reduce dose
Warfarin: increased warfarin effect, monitor blood levels

### Drug classifications
Antacids (containing magnesium, aluminum), iron salts: decreased absorption of ciprofloxacin
β-agonists, class IA/III antidysrhythmics, halogenated anesthetics, local anesthetics, macrolides, phenothiazines, tetracyclines, tricyclics: increased QT prolongation

**BLACK BOX WARNING:** Corticosteroids: increased tendonitis, tendon rupture

### Drug/food
Dairy products, food: decreased absorption

### Drug/lab test
Increased: AST, ALT, bilirubin, BUN, creatinine, alkaline phosphatase, LDH, glucose, proteinuria, albuminuria
Decreased: WBC, glucose

## NURSING CONSIDERATIONS

### Assessment
- Assess patient for previous sensitivity reaction
- Assess patient for signs and symptoms of **infection** including characteristics of wounds, sputum, urine, stool, WBC >10,000/mm$^3$, fever; obtain baseline information before, during treatment
- Obtain C&S before beginning product therapy to identify if correct treatment has been initiated
- Assess for **Stevens Johnson syndrome**, anaphylaxis: rash, urticaria, dyspnea, pruritus, chills, fever, joint pain; discontinue immediately, have emergency equipment nearby may occur a few days after therapy begins; EPINEPHrine and resuscitation equipment should be available for anaphylactic reaction
- Identify urine output; if decreasing, notify prescriber (may indicate nephrotoxicity); also check for increased BUN, creatinine
- Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test monthly if patient is on long-term therapy
- Monitor electrolytes: potassium, sodium, chloride monthly if patient is on long-term therapy

**BLACK BOX WARNING:** Myasthenia gravis: avoid use in these patients, increases muscle weakness

- **QT prolongation:** monitor for changes in QTc if taking other products that increase QT
- Assess for **CNS symptoms:** headache, dizziness, fatigue, insomnia, depression, seizures
- Monitor for bleeding: ecchymosis, bleeding gums, hematuria, stool guaiac daily if on long-term therapy
- Assess for **overgrowth of infection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum

**BLACK BOX WARNING:** Assess for tendon pain, especially in children

**BLACK BOX WARNING:** Tendonitis, tendon rupture: discontinue at first sign of tendon pain, inflammation; increased in those >60 yr, those taking corticosteroids, organ transplant recipients

- **Pseudomotor cerebri:** may occur at excessive doses
- *Clostridium difficile*–associated diarrhea (CDAD); monitor for diarrhea, abdominal pain, cramps, fever, bloody stools, usually occurs several weeks after completion of therapy, report to prescriber immediately
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, excreted in breast milk, discontinue breastfeeding or product

### Patient/family education
- Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
- Teach patient to contact prescriber if adverse reaction occurs or if inflammation or pain in tendon occurs before, 6 hr after
- Teach patient not to crush or chew the extended-release product
- Instruct patient to take all medication prescribed for the length of time ordered; product must be taken around the clock to maintain blood levels; do not give medication to others

**BLACK BOX WARNING:** Teach patient to report tendon pain, chest pain, palpitations

- Advise patient to rinse mouth frequently, use sugarless candy or gum for dry mouth, to drink fluids to prevent crystals in urine
- Teach patient to notify prescriber if rash occurs, discontinue product
- Teach patient to notify prescriber if pregnancy is planned or suspected, do not breastfeed
- Teach patient to contact prescriber if taking theophylline, warfarin

### Evaluation
**Positive therapeutic outcome**
- Absence of signs/symptoms of infection (WBC <10,000/mm$^3$, temp WNL, absence of red draining wounds)
- Reported improvement in symptoms of infection

## ciprofloxacin ophthalmic
*See Appendix B*

**⚠ HIGH ALERT**

## cisatracurium (Rx)

(sis-a-tra-cyoor'ee-um)
**Nimbex**
*Func. class.:* Neuromuscular blocker (nondepolarizing)

**ACTION:** Inhibits transmission of nerve impulses by binding with cholinergic receptor sites, antagonizing action of acetylcholine

**Therapeutic outcome:** Paralysis of body for administration of anesthesia

**USES:** Facilitation of endotracheal intubation, skeletal muscle relaxation during mechanical ventilation surgery, or general anesthesia

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children <2 yr, electrolyte imbalances, dehydration, cardiac/neuromuscular/respiratory disease, metabolic alkalosis, respiratory acidosis, myopathy, myasthenia gravis

## DOSAGE AND ROUTES

**Adult: IV** 0.15 and 0.2 mg/kg depending on desired time to intubate and length of surgery: use peripheral nerve stimulation to evaluate dosage
**Child 2-12 yr: IV** 0.1 mg/kg over 5-10 sec with halothane or opioid anesthesia

**Available forms:** Inj 2, 10 mg/ml

### Implementation

**IV route**
- Use nerve stimulator by anesthesiologist to determine neuromuscular blockade
- Give anticholinesterase to reverse neuromuscular blockade
- Give by slow **IV** only by qualified person; do not administer IM
- Store in light-resistant area
- Reassure if communication is difficult during recovery from neuromuscular blockage

## ADVERSE EFFECTS

**CV:** Bradycardia, tachycardia; increased, decreased B/P
**EENT:** Increased secretions
**INTEG:** Rash, flushing, pruritus, urticaria
**RESP:** Prolonged apnea, bronchospasm, cyanosis, respiratory depression

### Pharmacokinetics

Unknown

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 1-3 min |
| **Peak** | 2-5 min |
| **Duration** | 30-40 min |

## INTERACTIONS

### Individual drugs

CarBAMazepine, phenytoin: decreased duration of neuromuscular blockade, dose of cisatracurium may need to be increased
Isoflurane, lithium: increased neuromuscular blockade
Succinylcholine: decreased neuromuscular blockade

### Drug classifications

Aminoglycosides, antibiotics (polymix), β-adrenergic blockers, opioids: increased neuromuscular blockade

## NURSING CONSIDERATIONS

### Assessment

- This product is not an analgesic, treat pain with other agents
- Assess for **electrolyte imbalances** (K, Mg), may lead to increased action of this product
- Assess vital signs (B/P, pulse, respirations, airway) until fully recovered; rate, depth, pattern of respirations; strength of handgrip
- Assess I&O ratio: check for urinary retention, frequency, hesitancy
- Assess **recovery:** decreased paralysis of face, diaphragm, legs, arms, rest of body
- Assess **allergic reactions:** rash, fever, respiratory distress, pruritus; product should be discontinued
- **Malignant hyperthermia:** Assess for malignant hyperthermia in those with a family history; the product should be used cautiously or avoided in these patients
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, cautious use in breastfeeding, excretion unknown

### Evaluation

**Positive therapeutic outcome**
- Paralysis of jaw, eyelid, head, neck, rest of body

## TREATMENT OF OVERDOSE:

Neostigmine, atropine, monitor VS; mechanical ventilation

**⚠ HIGH ALERT**

## CISplatin (Rx)

(sis′pla-tin)

**Platinol** 🍁

*Func. class.:* Antineoplastic alkylating agent

*Chem. class.:* Inorganic heavy metal

**Do not confuse:** CISplatin/CARBOplatin

**ACTION:** Alkylates DNA, RNA; inhibits enzymes that allow synthesis of amino acids in proteins; activity is not cell cycle phase specific

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** Advanced bladder cancer; adjunctive in metastatic testicular cancer and metastatic ovarian cancer

## CONTRAINDICATIONS

Pregnancy, breastfeeding

**BLACK BOX WARNING:** Bone marrow suppression, platinum compound hypersensitivity

**Precautions:** Geriatric patients, vaccination, infections, extravasation, peripheral neuropathy, radiation therapy

**BLACK BOX WARNING:** Chemotherapy-induced nausea/vomiting; in children, nephrotoxicity, ototoxicity; requires a specialized care setting and an experienced clinician

## DOSAGE AND ROUTES

Dosage protocols may vary

### Metastatic testicular cancer

**Adult: IV** 20 mg/m$^2$ daily × 5 days, repeat q3wk for 2 cycles or more, depending on response

### Advanced bladder cancer

**Adult: IV** 50-70 mg/m$^2$ q3-4wk

### Metastatic ovarian cancer

**Adult: IV** 100 mg/m$^2$ q4wk or 75-100 mg/m$^2$ q3wk with cyclophosphamide therapy

**Available forms:** Inj 0.5 mg/ml 🍁, 1 mg/ml

### Implementation

**IV route**

- Hydrate patient with 0.9% NaCl over 8-12 hr before treatment
- Give all medications PO, if possible; avoid IM inj when platelets <100,000/mm$^3$
- Give EPINEPHrine, antihistamines, corticosteroids for hypersensitivity reaction; antiemetic 30-60 min before giving product to prevent vomiting, and prn; allopurinol or sodium bicarbonate to maintain uric acid level, alkalinization of urine; antibiotics for prophylaxis of infection; diuretic (furosemide 40 mg **IV**) or mannitol after infusion
- Prepare in biological cabinet using gown, gloves, mask; do not allow product to come in contact with skin; use soap and water if contact occurs, use cytotoxic handling procedures
- Do not use aluminum equipment during any preparation or administration, will form precipitate; do not refrigerate unopened powder or solution; protect from sunlight

**Intermittent IV infusion route**

- Give after **diluting** 10 mg/10 ml or 50 mg/50 ml sterile water for inj; **withdraw** prescribed dose, **dilute** ½ dose with 1000 ml $D_5$ 0.2 NaCl or $D_5$ 0.45 NaCl with 37.5 g mannitol; **IV** inf is **given** over 3-4 hr; use a 0.45 μm filter; total dose 2000 ml over 6-8 hr; check site for irritation, phlebitis; do not use equipment containing aluminum

**Continuous IV infusion route**

- Give over 24 hr × 5 days

**Y-site compatibilities:** Acyclovir, alfentanil, allopurinol, amikacin, aminophylline, amiodarone, ampicillin, ampicillin-sulbactam, anidulafungin, atenolol, atracurium, azithromycin, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, carmustine, caspofungin, ceFAZolin, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, cladribine, clindamycin, codeine, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, DAUNOrubicin, dexamethasone, dexmedetomidine, dexrazoxane, digoxin, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doripenem, doxacurium, DOXOrubicin, DOXOrubicin liposomal, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, ertapenem, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, fluorouracil, foscarnet, fosphenytoin, furosemide, ganciclovir, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, haloperidol, heparin, hydrocortisone, HYDROmorphone, IDArubicin, ifosfamide, imipenem-cilastatin, inamrinone, indomethacin, irinotecan, isoproterenol, ketorolac, labetalol, leucovorin, levofloxacin, levorphanol, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, melphalan, meperidine, meropenem, methohexital, methotrexate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE,

midazolam, milrinone, minocycline, mitoMYcin, mitoXANtrone, mivacurium, nafcillin, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ofloxacin, ondansetron, oxaliplatin, PACLitaxel, palonosetron, pamidronate, pancuronium, PEMEtrexed, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phenylephrine, phenytoin, piperacillin, polymyxin B, potassium chloride/phosphates, procainamide, prochlorperazine, promethazine, propofol, propranolol, quiNIDine, quinupristin-dalfopristin, raNITIdine, remifentanil, riTUXimab, sargramostim, sodium acetate/bicarbonate/phosphates, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, tacrolimus, teniposide, theophylline, thiopental, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA, tobramycin, topotecan, trastuzumab, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

**Solution compatibilities:** $D_5$/0.225% NaCl, $D_5$/0.45% NaCl, $D_5$/0.9% NaCl, $D_5$/0.45% NaCl with mannitol 1.875%, $D_5$/0.33% NaCl with mannitol 1.875%, $D_5$/0.33% NaCl with KCl 20 mEq and mannitol 1.875%, 0.9% NaCl, 0.45% NaCl, 0.3% NaCl, 0.225% NaCl, water

**Solution incompatibilities:** Sodium bicarbonate 5%, 0.1% NaCl, water

## ADVERSE EFFECTS

**CNS:** Seizures, *peripheral neuropathy*
**CV:** Cardiac abnormalities
**EENT:** *Tinnitus, hearing loss, vestibular toxicity*, blurred vision, altered color perception
**GI:** *Severe nausea, vomiting, diarrhea, weight loss*
**GU:** Renal tubular damage, *renal insufficiency,* impotence, sterility, amenorrhea, gynecomastia, hyperuremia
**HEMA:** Thrombocytopenia, leukopenia, pancytopenia, *anemia*
**INTEG:** *Alopecia,* dermatitis
**META:** *Hypomagnesemia, hypocalcemia, hypokalemia*, hypophosphatemia
**RESP:** Fibrosis
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete |
| **Distribution** | Widely distributed, accumulates in body tissues for several months |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 24 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Alcohol, aspirin: increased risk of bleeding
Bumetanide, ethacrynic acid, furosemide: ototoxicity
Phenytoin: decreased phenytoin effect

### Drug classifications

Aminoglycosides, diuretics (loop), salicylates: increased nephrotoxicity
Myelosuppressive agents, radiation: increased myelosuppression
NSAIDs: increased risk of bleeding
Vaccines, live virus: decreased antibody response

### Drug/lab test

Increased: uric acid, BUN, creatinine
Decreased: CCr, calcium, phosphate, potassium, magnesium
Positive: Coombs' test

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Monitor for **bone marrow depression:** CBC, differential, platelet count weekly; withhold product if WBC count is $<4000/mm^3$ or platelet count is $<100{,}000/mm^3$; notify prescriber of results if WBC $<20{,}000/mm^3$, platelets $<150{,}000/mm^3$

**BLACK BOX WARNING:** Monitor **renal toxicity:** BUN, creatinine, serum uric acid, urine CCr before, during therapy; I&O ratio; report fall in urine output to <30 ml/hr; dose should not be given if BUN <25 mg/dl; creatinine <1.5 mg/dl, toxicity is cumulative, withhold until renal function returns to normal

**BLACK BOX WARNING:** Assess for anaphylaxis: wheezing, tachycardia, facial swelling, fainting; discontinue product and report to prescriber; resuscitation equipment should be nearby, may occur within minutes; often EPINEPHrine, corticosteroids, antihistamines may alleviate symptoms

- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding
- Monitor temp q4hr (may indicate beginning of infection)
- Monitor liver function tests before, during therapy (bilirubin, AST, ALT, LDH) as needed or monthly; note yellowing of skin or sclera, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea

• Assess for increased uric acid levels, swelling, joint pain primarily in extremities; patient should be well hydrated to prevent urate deposits
• Assess for **bleeding:** hematuria, stool guaiac, bruising or petechiae, mucosa or orifices q8hr; note inflammation of mucosa, breaks in skin
• Identify dyspnea, crackles, nonproductive cough, chest pain, tachypnea

**BLACK BOX WARNING: Ototoxicity:** more common in genetic variants TPMT 3B and 3C in children; use audiometric testing baseline and before each dose, usually tinnitus or loss of high-frequency sounds are first indication of ototoxicity

• Identify effects of alopecia on body image; discuss feelings about body changes
• Identify edema in feet, joint pain, stomach pain, shaking; prescriber should be notified

### Patient/family education

• Teach patient to avoid use of products containing aspirin or ibuprofen, NSAIDs, alcohol (may cause GI bleeding), razors, commercial mouthwash; to report symptoms of bleeding (hematuria, tarry stools, bruising, petechiae)
• Advise patient to report numbness, tingling in face or extremities, poor hearing or joint pain, swelling
• Instruct patient to report signs of anemia (fatigue, headache, irritability, faintness, shortness of breath)
• Instruct patient to report any changes in breathing or coughing even several months after treatment; to avoid crowds and persons with respiratory tract or other infections
• Advise patient that hair may be lost during treatment; a wig or hairpiece may make patient feel better; new hair may be different in color, texture
• Tell patient not to have any vaccinations without the advice of the prescriber; serious reactions can occur
• **Pregnancy/breastfeeding:** caution patient contraception is needed during treatment and for 4 months after the completion of therapy, pregnancy

**BLACK BOX WARNING: Ototoxicity:** teach patient to report loss of hearing, ringing or roaring in the ears

### Evaluation

**Positive therapeutic outcome**
• Prevention of rapid division of malignant cells

## citalopram (Rx)

(sigh-tal′oh-pram)
**CeleXA**
*Func. class.:* Antidepressant
*Chem. class.:* Selective serotonin reuptake inhibitor (SSRI)

**Do not confuse:** CeleXA/CeleBREX/Cerebyx/ZyPREXA

**ACTION:** Inhibits CNS neuron uptake of serotonin but not of norepinephrine; weak inhibitor of CYP450 enzyme system, making it more appealing than other products

**Therapeutic outcome:** Decreased symptoms of depression after 2-3 wk

**USES:** Major depressive disorder

**Unlabeled uses:** Premenstrual disorders, panic disorder, social phobia, obsessive-compulsive disorder in adolescents, anxiety, hot flashes, menopause, adjunct in schizophrenia, PTSD

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, geriatric, renal/hepatic disease, seizure disorder, hypersensitivity to escitalopram, bradycardia, recent MI, abrupt discontinuation, QT prolongation

**BLACK BOX WARNING:** Children, suicidal ideation

## DOSAGE AND ROUTES

### Depression

**Adult:** PO 20 mg daily AM or PM, may increase if needed to 40 mg/day after 1 wk; maintenance: after 6-8 wk of initial treatment, continue for 24 wk (32 wk total)

### Hepatic dose/geriatric

**Adult:** PO 20 mg/day, may increase to 40 mg/day if no response

### Panic disorder (unlabeled)

**Adult:** PO 20-40 mg/day

### Premenstrual dysphoria, social phobia (unlabeled)

**Adult:** PO 10-30 mg/day used intermittently in premenstrual dysphoria

**Available forms:** Tabs 10, 20, 40 mg; oral SOL 10 mg/5 ml

### Implementation

• Give with food or milk for GI symptoms
• Give dosage at bedtime if oversedation occurs during day

• Leave orally disintegrating tabs on tongue and allow to dissolve before swallowing
• Store at room temperature; do not freeze
• Do not give within 14 days of MAOIs

## ADVERSE EFFECTS

**CNS:** *Headache, nervousness, insomnia, drowsiness, anxiety, tremor, dizziness, fatigue, sedation, poor concentration, abnormal dreams, agitation,* seizures, apathy, euphoria, hallucinations, delusions, psychosis, suicidal attempts, malignant neuroleptic-like syndrome reactions
**CV:** *Hot flashes, palpitations,* angina pectoris, hemorrhage, hypertension, tachycardia, 1st-degree AV block, bradycardia, MI, thrombophlebitis, QT prolongation, orthostatic hypotension, torsades de pointes
**EENT:** Vision changes, ear/eye pain, photophobia, tinnitus
**GI:** *Nausea, diarrhea, dry mouth, anorexia, dyspepsia, constipation, cramps, vomiting, taste changes, flatulence, decreased appetite*
**GU:** *Dysmenorrhea, decreased libido, urinary frequency, urinary tract infection,* amenorrhea, cystitis, impotence, urine retention
**INTEG:** *Sweating, rash, pruritus,* acne, alopecia, urticaria, photosensitivity
**MS:** *Pain,* arthritis, twitching
**RESP:** *Infection, pharyngitis, nasal congestion, sinus headache, sinusitis, cough, dyspnea, bronchitis,* asthma, hyperventilation, pneumonia
**SYST:** *Asthenia, viral infection, fever, allergy, chills,* hyponatremia (geriatric patients), serotonin syndrome, neonatal abstinence syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Liver, by CYP1A2, CYP2D6 several patients are poor metabolizers |
| **Excretion** | Kidneys, steady state 28-35 days |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
CarBAMazepine, cloNIDine: decreased citalopram levels
Lithium, linezolid, methylene blue, tricyclics, fentaNYL, busPIRone, triptans, traMADol, traZODone: increased serotonin syndrome
Pimoside, ziprasidone: increased QTc interval; do not use together

### Drug classifications

Anticoagulants, antiplatelets, NSAIDs, salicylates, thrombolytics: increased risk of bleeding
Antidepressants (tricyclics): increased effect, use cautiously
Antifungals (azole), macrolides: increased citalopram levels
β-Adrenergic blockers: increased plasma levels of β-blockers
Barbiturates, benzodiazepines, CNS depressants, sedatives/hypnotics: increased CNS depression
**MAOIs:** hypertensive crisis, seizures, fatal reactions; do not use together within 14 days
**Quinolones:** increased QTc interval; do not use together
Serotonin receptor agonists, SNRIs, SSRIs: increased serotonin syndrome

### Drug/herb

SAM-e, St. John's wort: serotonin syndrome; do not use with citalopram; fatal reaction may occur
Yohimbe: increased CNS stimulation

### Drug/lab test

Increased: serum bilirubin, blood glucose, alkaline phosphatase
Decreased: VMA, 5-HIAA
False increase: increased urinary catecholamines

## NURSING CONSIDERATIONS

### Assessment

• Monitor B/P (lying, standing), pulse q4hr; if systolic B/P drops 20 mm Hg, hold product and notify prescriber; take vital signs q4hr in patients with cardiovascular disease
• Monitor blood studies: CBC, leukocytes, differential, cardiac enzymes if patient is receiving long-term therapy; check platelets; bleeding can occur
• Monitor hepatic studies: AST, ALT, bilirubin
• Check weight qwk; appetite may increase with product
• Assess ECG for flattening of T wave, bundle branch block, AV block, dysrhythmias in cardiac patients, torsades de pointes, QT prolongation (effect is dose dependent)
• Assess EPS primarily in geriatric: rigidity, dystonia, akathisia

**BLACK BOX WARNING:** Assess mental status: mood, sensorium, affect, suicidal tendencies; increase in psychiatric symptoms: depression, panic, risk for suicide is greater in children and those ≤ 24 yr, these patients should be evaluated q4wk and q3wk × 4 wk

• Monitor urinary retention, constipation; constipation is more likely to occur in children or geriatric

- **Assess for serotonin syndrome:** increased heart rate, sweating, dilated pupils, tremors, twitching, hyperthermia, agitation, hyperreflexia, nausea, vomiting, diarrhea, coma, hallucinations; may be worse in those taking (SSRIs, SNRIs, triptans)
- Identify patient's alcohol consumption; if alcohol is consumed, hold dose until AM
- **Beers:** Avoid in older adults unless safer alternative is not available, may cause ataxia, impaired psychomotor function
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, excreted in breast milk, discontinue breastfeeding or product

### Patient/family education

- Teach patient that therapeutic effects may take 4-6 wk, not to discontinue abruptly
- Instruct patient to use caution in driving or other activities requiring alertness because of drowsiness, dizziness, blurred vision; to avoid rising quickly from sitting to standing, especially geriatric patients

**BLACK BOX WARNING:** Advise that suicidal ideas, behavior may occur in children or young adults, to watch closely for suicidal thoughts, behaviors, notify prescriber immediately

- Caution patient to avoid alcohol ingestion, other CNS depressants
- To use sunscreen, protective clothing to prevent photosensitivity
- Teach patient to notify prescriber if planned or suspected pregnancy, not to breastfeed
- Instruct patient to increase fluids, bulk in diet if constipation, urinary retention occur, especially geriatric
- Advise patient to take gum, hard sugarless candy, or frequent sips of water for dry mouth
- Teach patient how to use orally disintegrating tabs
- **Teach patient to report serotonin syndrome:** sweating, dilated pupils, tremors, twitching, extreme heat, agitation

### Evaluation

**Positive therapeutic outcome**

- Decrease in depression
- Absence of suicidal thoughts

## clarithromycin (Rx)

(clare-i-thro-mye'sin)

**Biaxin, Biaxin XL**

*Func. class.:* Antiinfective

*Chem. class.:* Macrolide

**ACTION:** Binds to 50S ribosomal subunits of susceptible bacteria and suppresses protein synthesis

**Therapeutic outcome:** Bactericidal action against the following: *Streptococcus pneumoniae, Streptococcus pyogenes, Mycoplasma pneumoniae, Corynebacterium diphtheriae, Bordetella pertussis, Listeria monocytogenes, Haemophilus influenzae, Staphylococcus aureus, Mycobacterium avium (MAC), Legionella pneumophila, Moraxella catarrhalis, Neisseria gonorrhoeae,* complex infections in AIDS patients, *Helicobacter pylori* in combination with omeprazole, *Helicobacter parainfluenzae*

**USES:** Mild to moderate infections of the upper respiratory tract, lower respiratory tract; uncomplicated skin and skin structure infections

## CONTRAINDICATIONS

Hypersensitivity to this product or other macrolides, torsades de pointes, QT prolongation

**Precautions:** Pregnancy, breastfeeding, geriatric, renal/hepatic disease, QT prolongation

## DOSAGE AND ROUTES

### Acute exacerbation of chronic bronchitis

**Adult:** PO 250-500 mg q12hr × 7-14 days or 1000 mg/day × 7 days (XL)

### Pharyngitis/tonsillitis

**Adult:** PO 250 mg q12hr × 10 days

### Community-acquired pneumonia

**Adult:** PO 250 mg q12hr × 7-14 days or 1000 mg/day × 7 days (XL)

### Endocarditis prophylaxis

**Adult:** PO 500 mg 1 hr before procedure

### MAC prophylaxis/treatment

**Adult:** PO 500 mg bid, will require an additional antiinfective for active infection

### *H. pylori* infection

**Adult:** PO 500 mg with 30 mg lansoprazole and 1 g amoxicillin together q12hr × 10-14 days or 500 mg with omeprazole 20 mg and 1 g amoxicillin together q12hr × 10 days or 500 mg q8hr and omeprazole 40 mg q d × 14 days, continue omeprazole for 14 more days

### Acute maxillary sinusitis

**Adult:** PO 500 mg q12hr × 14 days

### Most infections

**Child:** PO 7.5 mg/kg q12hr × 10 days, max 500 mg/dose for MAC

### Renal dose

**Adult:** PO CCr 30-60 ml/min; decrease dose by 50% if using with ritonavir; CCr < 30 ml/min reduce dose by 50%, if used with ritonavir, reduce by 75%

**Available forms:** Tabs 250, 500 mg; oral susp 125, 250 mg/5 ml; ext rel tab (XL) 500 mg

### Implementation

- Do not break, crush, or chew ext rel tab
- Ensure adequate fluid intake (2 L) during diarrhea episodes
- Give q12hr to maintain serum level
- Store at room temperature
- **Susp:** Shake well, store at room temperature, discard after 2 wk
- **Ext Rel:** Give with food

## ADVERSE EFFECTS

**CV:** Ventricular dysrhythmias, QT prolongation
**GI:** Nausea, vomiting, diarrhea, hepatotoxicity, abdominal pain, stomatitis, heartburn, anorexia, abnormal taste, pseudomembranous colitis, tooth/tongue discoloration, pancreatitis
**GU:** Vaginitis, moniliasis, interstitial nephritis, azotemia
**HEMA:** Leukopenia, thrombocytopenia, increased INR
**INTEG:** Rash, urticaria, pruritus, Stevens-Johnson syndrome, toxic epidermal necrolysis
**MISC:** Headache, hearing loss

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 50% |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, unchanged (20%-30%) |
| **Half-life** | 5-7 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2 hr; Ext release: 5-7 hr; |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

ALPRAZolam, busPIRone, carBAMazepine, cycloSPORINE, digoxin, disopyramide, felodipine, fluconazole, omeprazole, tacrolimus, theophylline: increased levels, increased toxicity
CarBAMazepine: increased toxicity, from increased levels of carBAMazepine
Increase: Myopathy risk: atorvastatin, pravastatin, use lowest effective dose
Increase: Rhabdomyolysis risk: lovastatin, simvastatin, do not use concurrently
Cisapride, pimozide: increased effect, increased dysrhythmias
Theophylline: increased toxicity from increased levels of theophylline, increased oral anticoagulant effect
Increase: Bleeding risk with warfarin, monitor INR
Increase: Levels of sildenafil, tadalafil, vardenafil, avoid concurrent use

### Drug classifications

All products metabolized by CYP3A enzyme system: increased action, risk of toxicity
Antidiabetics: increased toxicity
Digoxin: increased blood levels of digoxin, increased digoxin effects
Calcium channel blockers, benzodiazepines: increased effects
Class IA, III antidysrhythmics, quiNIDine, procainamide, dofetilide, sotalol, amiodarone or other products that prolong QT: increased QT prolongation
Ergots: increased levels, increased toxicity
Oral anticoagulants: increased effects of oral anticoagulants

### Drug/food

Do not use with grapefruit juice

### Drug/herb

Decrease: Clarithromycin effect: St. John's wort

### Drug/lab test

Increased: AST, ALT, BUN, creatinine, LDH, total bilirubin, INR, PT

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for signs and symptoms of **infection** including characteristics of wounds, sputum, urine, stool, WBC >10,000/mm$^3$, earache, fever; obtain baseline information before, during treatment; obtain C&S before beginning product therapy to identify if correct treatment has been initiated, product may be given as soon as culture is taken, repeat after treatment
- Bleeding: check INR if anticoagulants are taken
- Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test monthly if patient is on long-term therapy
- Assess for overgrowth of infection: perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum
- **Assess for QT prolongation, ventricular dysrhythmias:** monitor ECG, cardiac status in those with cardiac abnormalities
- **Assess for serious skin reaction:** Stevens-Johnson syndrome, toxic epidermal necrolysis, product should be discontinued immediately, may occur after therapy is concluded
- ***Clostridium difficile*–associated diarrhea (CDAD):** Monitor for diarrhea, cramping, blood in stools, fever, report immediately to prescriber, may start up to several weeks after conclusion of treatment

• **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, excreted in breast milk, cautious use in breastfeeding

### Patient/family education

• Advise patient to contact physician if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate superinfection
• Instruct patient to take all medication prescribed for the length of time ordered, ext rel with food
• Advise prescriber if pregnancy is planned or suspected
• Teach patient to notify prescriber of diarrhea, dark urine, pale stools, yellowing of eyes/skin, severe abdominal pain

### Evaluation

**Positive therapeutic outcome**

• Absence of signs/symptoms of infection: WBC $<10,000/mm^3$, temp WNL, absence of red draining wounds
• Reported improvement in symptoms of infection

## clavulanate

*See amoxicillin/clavulanate, ticarcillin/clavulanate*

## clevidipine (Rx)

(klev-id'i-peen)
**Cleviprex**
*Func. class.:* Calcium channel blocker (L-type)
*Chem. class.:* Dihydropyridine

**ACTION:** L-type calcium channels mediate the influx of calcium during depolarization in arterial smooth muscle; reduces mean arterial B/P by decreasing systemic vascular resistance

**Therapeutic outcome:** Decreased B/P

**USES:** Treatment of hypertension when oral therapy is not feasible

## CONTRAINDICATIONS

Hypersensitivity to this product, eggs, or soya lecithin; defective lipid metabolism; severe aortic stenosis; pancreatitis

**Precautions:** Pregnancy, breastfeeding, children <18 yr, heart failure, hyperlipidemia, hypertension, labor, pheochromocytoma

## DOSAGE AND ROUTES

**Adult:** CONT **IV** 1-2 mg/hr; dose may be doubled q90sec initially; as B/P reaches goal, adjust dose less frequently (5-10 min) with smaller increases in dose; most patients require 4-6 mg/hr, max 32 mg/hr; no more than 1000 ml should be infused per 24 hr period due to lipid load restrictions

**Available forms:** Single dose vial 50, 100 ml (0.5 mg/ml)

### Implementation

**Intermittent IV infusion route**

• Do not give through same line as other medications, do not dilute, do not filter
• Gently invert several times before use; do not use if discolored or if particulate matter is present
• Give through central or peripheral line at 1-2 mg/hr, use infusion device
• Store vials in refrigerator, do not freeze; leave vials in carton until use; product is photosensitive but protection from light during administration is not required

**Solution compatibilities:** Water for injection, 0.9% NaCl, D5W, D%W/ 0.9% NaCl, D5/LR, LR 10% amino acid

## ADVERSE EFFECTS

**CNS:** Headache
**CV:** Hypotension, reflex tachycardia, hypotension, rebound hypertension, syncope, atrial fibrillation
**GI:** Nausea, vomiting
**GU:** Renal failure
**MS:** Arthralgia
**GU:** Acute renal failure

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding >99% |
| **Metabolism** | By esterases in blood, extravascular tissues |
| **Excretion** | Urine 63%-74%, feces 7%-22% |
| **Half-life** | Initially 1 min; terminal 15 min; increased in hepatic disease |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 2-4 min |
| **Peak** | 6-12 hr |
| **Duration** | Unknown |

## NURSING CONSIDERATIONS

### Assessment

• Assess cardiac status: B/P, pulse, respiration, ECG; some patients have developed severe angina, acute MI after calcium channel blockers if obstructive CAD is severe; if not transitioned to

other antihypertensive therapies following clevidipine infusion, patients should be monitored ≥8 hr for rebound hypertension; monitor for rebound hypertension following drug stoppage
- **Renal failure:** Monitor I&O ratio, weight daily; peripheral edema, dyspnea, jugular vein distention, crackles (perioperative hypertensive patients)
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, excretion unknown, cautious use in breastfeeding

### Patient/family education
- Instruct patient to notify prescriber immediately if neurological symptoms, visual changes, or symptoms of HF occur
- To inform the patient of reason for product, expected result
- Instruct patient to continue follow-up for hypertension in those with hypertension
- Teach patient to notify prescriber if pregnancy is planned or suspected or if breastfeeding

### Evaluation
**Positive therapeutic outcome**
- Decreased B/P

## clindamycin HCl (Rx)
(klin-dah-my'sin)
**Cleocin HCl, Dalacin C** 🍁
## clindamycin palmitate (Rx)
**Cleocin Pediatric, Dalacin C Flavored Granules** 🍁
## clindamycin phosphate (Rx)
**Cleocin Phosphate, Dalacin C phosphate Sterile Solution** 🍁
*Func. class.:* Antiinfective—miscellaneous
*Chem. class.:* Lincomycin derivative

**ACTION:** Binds to 50S subunit of bacterial ribosomes; suppresses protein synthesis

**Therapeutic outcome:** Absence of infection

**USES:** Infections caused by staphylococci, streptococci, *Rickettsia, Fusobacterium, Actinomyces, Peptococcus, Bacteroides, Pneumocystis jiroveci*

## CONTRAINDICATIONS
Hypersensitivity to this product or lincomycin, tartrazine dye, ulcerative colitis/enteritis

**BLACK BOX WARNING:** Pseudomembranous colitis

**Precautions:** Pregnancy, breastfeeding, geriatric, renal/liver/GI disease, asthma, allergy

**BLACK BOX WARNING:** Diarrhea

C

## DOSAGE AND ROUTES
**Adult:** PO 150-450 mg q6hr, max 2.7 g/day; IM/**IV** 1.2-2.7 g/day in 2-4 divided doses q6-12hr, max 4.8 g/day
**Child >1 mo:** PO 8-25 mg/kg/day in divided doses q6-8hr; IM/**IV** 20-40 mg/kg/day in divided doses q6-8hr in 3-4 equal doses
**Neonate:** 15-20 mg/kg/day divided q6-8hr

### PID
**Adult:** **IV** 900 mg q8hr plus gentamicin

### Bacterial endocarditis prophylaxis
**Adult:** 600 mg 1 hr before procedure

### *P. jiroveci* pneumonia (unlabeled)
**Adult:** PO 1200-1800 mg/day in divided doses with 15-30 mg primaquine/day × 21 days

**Available forms: Phosphate:** inj 150, 300, 600 mg base/4 ml; 900 mg base/6 ml; inj inf in $D_5$ 300, 600, 900 mg; **HCl:** caps 75, 150, 300 mg; **palmitate:** oral sol 75 mg/5 ml

### Implementation
- Obtain C&S before use

**PO route**
- Do not break, crush, or chew caps
- Give with 8 oz of water; give with meals for GI symptoms
- Shake liquids well
- Do not refrigerate oral preparations; stable at room temperature for 2 wk

**Oral sol**
- Do not refrigerate reconstituted product, store at room temperature ≤2 wk
- Reconstitute granules with most of 75 ml of water, shake well, add remaining water, shake well (75 mg/5 ml)

**IM route**
- If more than 600 mg must be given, divide into 2 inj
- Give deeply in large muscle mass; rotate sites

**IV route**
- Visually inspect parenteral products for particulate matter and discoloration prior to use
- **Vials:** Dilute 300 and 600 mg doses with 50 ml of a compatible diluent. Dilute 900 mg doses with 50-100 ml of a compatible diluent. Dilute 1200 mg doses with 100 ml of a compatible diluent, final concentration max 18 mg/ml
- **ADD-Vantage vials:** Dilute 300 and 600 mg ADD-Vantage containers with 50 or 100 mg, respectively, of NS or $D_5W$

• **Storage:** When diluted in $D_5W$, NS, or LR, solutions with concentrations of 6, 9, or 12 mg/ml are stable for 16 days at room temperature or 32 days under refrigeration when stored in glass bottles or minibags. When diluted in $D_5W$, solutions with a concentration of 18 mg/ml are stable for 16 days at room temperature

**Intermittent IV infusion**

• Infuse over at least 10-60 min, infusion rates max 30 mg/min and ≤1.2 g should be infused in a 1 hr period

• Infuse 300 mg doses over 10 min; 600 mg doses over 20 min, 900 mg doses over 30 min, and 1200 mg doses over 40 min

**Continuous IV infusion**

• Give first dose rapidly, and then follow with continuous infusion; rate is based on desired serum clindamycin levels

• To maintain serum concentrations above 4 mcg/ml, use a rapid infusion rate of 10 mg/min for 30 min and a maintenance rate of 0.75 mg/min; to maintain serum concentrations above 5 mcg/ml, use a rapid infusion rate of 15 mg/min for 30 min and a maintenance rate of 1 mg/min; to maintain serum concentrations above 5 mcg/ml, use a rapid infusion rate of 20 mg/min for 30 min and a maintenance rate of 1.25 mg/min

**Y-site compatibilities:** Acyclovir, alfentanil, amifostine, amikacin, aminocaproic acid, aminophylline, amiodarone, amphotericin B cholesteryl, amphotericin B lipid complex, amsacrine, anakinra, anidulafungin, ascorbic acid injection, atenolol, atracurium, atropine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, cefamandole, ceFAZolin, cefmetazole, cefonicid, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, cefpirome, ceftAZidime, ceftizoxime, ceftobiprole, cefuroxime, cephalothin, cephapirin, chloramphenicol, cimetidine, cisatracurium, CISplatin, codeine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, digoxin, dilTIAZem, diphenhydrAMINE, DOCEtaxel, DOPamine, doxacurium, DOXOrubicin, DOXOrubicin liposomal, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, epoetin alfa, eptifibatide, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, fludarabine, fluorouracil, folic acid, foscarnet, furosemide, gatifloxacin, gemcitabine, gemtuzumab, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, ifosfamide, imipenem-cilastatin, indomethacin, insulin (regular), irinotecan, isoproterenol, ketorolac, levofloxacin, lidocaine, linezolid, LORazepam, LR, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, metaraminol, methicillin, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, mezlocillin, miconazole, milrinone, morphine, moxalactam, multiple vitamins injection, nafcillin, nalbuphine, naloxone, nesiritide, netilmicin, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, pantoprazole, PEMEtrexed, penicillin G potassium/sodium, pentazocine, perphenazine, PHENobarbital, phenylephrine, phytonadione, piperacillin, piperacillin-tazobactam, potassium chloride, procainamide, propofol, propranolol, protamine, pyridoxine, raNITIdine, remifentanil, Ringer's, ritodrine, riTUXimab, rocuronium, sargramostim, sodium acetate/bicarbonate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA, tobramycin, tolazoline, TPN, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, vitamin B complex/C, voriconazole, zidovudine, zoledronic acid

**Y-site incompatibilities:** IDArubicin

## ADVERSE EFFECTS

**GI:** *Nausea, vomiting, abdominal pain, diarrhea,* pseudomembranous colitis, *anorexia, weight loss,* increased AST, ALT, bilirubin, alkaline phosphatase, jaundice

**GU:** *Vaginitis,* urinary frequency

**INTEG:** Rash, urticaria, pruritus, erythema, pain, abscess at inj site

**SYST:** Stevens-Johnson syndrome, exfoliative dermatitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO, IM), minimal (TOP) |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 2½ hr |

### Pharmacodynamics

| | PO | IM | IV |
|---|---|---|---|
| **Onset** | Rapid | Rapid | Rapid |
| **Peak** | 6-8 hr | 1½ hr | Infusion's end |

## INTERACTIONS

### Individual drugs

Erythromycin, decreased action of clindamycin, avoid using together
Kaolin/pectin: decreased absorption

### Drug/lab test

Increased: alkaline phosphatase, bilirubin, CPK, AST, ALT

## NURSING CONSIDERATIONS

### Assessment

• Assess patient for signs and symptoms of infection including characteristics of wounds, sputum, urine, stool, WBC >10,000/mm$^3$, fever; obtain baseline information before, during treatment; complete C&S testing before beginning product therapy; this will identify if correct treatment has been initiated, give product as soon as culture is taken, monitor appearance of wounds, sputum, stools, urine baseline and periodically
• Assess for allergic reactions: rash, urticaria, pruritus, chills, fever, joint pain; may occur a few days after therapy begins; EPINEPHrine and resuscitation equipment should be available in case of an anaphylactic reaction
• Identify urine output; if decreasing, notify prescriber (may indicate nephrotoxicity); also look for increased BUN and creatinine levels
• Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test monthly if patient is on long-term therapy
• Monitor electrolytes: potassium, sodium, chloride monthly if patient is on long-term therapy

**BLACK BOX WARNING:** Assess bowel pattern daily; if severe diarrhea occurs, product should be discontinued; may indicate **pseudomembranous colitis**, may occur several weeks after therapy is terminated

• Monitor for bleeding: ecchymosis, bleeding gums, hematuria, stool guaiac daily if on long-term therapy, may occur several weeks after therapy is terminated, use this product in serious infections only
• Assess for overgrowth of infection: perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum
• **Assess for serious skin infections:** Stevens-Johnson syndrome, exfoliative dermatitis (monitor for rash), discontinue at first appearance of rash, may occur after conclusion of therapy
• **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, excreted in breast milk, not recommended in breastfeeding

### Patient/family education

• Tell patient to take oral product with full glass of water; may take with food if GI symptoms occur; antiperistaltic products may worsen diarrhea
• Teach patient aspects of product therapy: need to complete entire course of medication to ensure organism death (10-14 days); culture may be taken after medication course has been completed
• Advise patient to report sore throat, fever, fatigue; may indicate superinfection
• Advise patient that product must be taken at equal intervals around clock to maintain blood levels

**BLACK BOX WARNING:** Teach patient to report diarrhea with pus, mucus, rash

### Evaluation

**Positive therapeutic outcome**

• Decreased temp, negative C&S

**TREATMENT OF HYPERSENSITIVITY:** Withdraw product; maintain airway; administer EPINEPHrine, aminophylline, $O_2$, **IV** corticosteroids

## clindamycin topical

*See Appendix B*

## clobetasol topical

*See Appendix B*

## clomiPHENE (Rx)

(kloe'mi-feen)
**Clomid**
*Func. class.:* Ovulation stimulant
*Chem. class.:* SERM (selective estrogen receptor modulator)

**Do not confuse:** clomiPHENE/clomiPRAMINE, Serophene/Sarafem

**ACTION:** Increases LH, FSH release from the pituitary, which increases maturation of ovarian follicle, ovulation, development of corpus luteum

**Therapeutic outcome:** Pregnancy

**USES:** Female infertility (ovulatory failure)

**CONTRAINDICATIONS**

Pregnancy, hypersensitivity, hepatic disease, undiagnosed uterine bleeding, uncontrolled thyroid or adrenal dysfunction, intracranial lesion, ovarian cysts, endometrial carcinoma

**Precautions:** Hypertension, depression, seizures, diabetes mellitus, abnormal ovarian enlargement, ovarian hyperstimulation

## DOSAGE AND ROUTES

**Adult:** PO 50-100 mg daily × 5 days or 50 mg daily beginning on day 5 of the menstrual cycle, may increase to 100 mg/day × 5 days with next cycle; may be repeated until conception occurs or 3 (max 6) cycles of therapy have been completed

**Available forms:** Tabs 50 mg

### Implementation

- Give after discontinuing estrogen therapy
- Give at same time daily to maintain product level; begin on 5th day of menstrual cycle
- Avoid heat, moisture, light, store at room temperature
- Give without regard to food

## ADVERSE EFFECTS

**CNS:** *Headache, depression,* restlessness, anxiety, nervousness, fatigue, insomnia, dizziness, flushing
**CV:** Vasomotor flushing, phlebitis, deep vein thrombosis
**EENT:** Blurred vision, diplopia, photophobia
**GI:** *Nausea, vomiting, constipation,* abdominal pain, bloating
**GU:** Polyuria, frequency of urination, birth defects, spontaneous abortions, multiple ovulation, breast pain, oliguria, abnormal uterine bleeding, ovarian cyst, hypertrophy of ovary, hot flashes
**INTEG:** *Rash, dermatitis,* urticaria, alopecia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well distributed |
| **Distribution** | Unknown |
| **Metabolism** | Liver, extensively |
| **Excretion** | Feces |
| **Half-life** | 5 days |

### Pharmacodynamics

Unknown

## NURSING CONSIDERATIONS

### Assessment

- Verify infertility workup, pelvic exam
- Determine liver function tests before therapy: AST, ALT, alkaline phosphatase
- Monitor serum progesterone, urinary excretion of pregnanediol to identify occurrence of ovulation
- Pelvic exam should be done to determine ovary size, condition of cervix
- Endometrial biopsy may be done in women over 35 to rule out endometrial carcinoma
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

- Advise patient that multiple births are common after product is taken
- Instruct patient to notify prescriber immediately if low abdominal pain occurs; may indicate ovarian cyst, cyst rupture; ovarian hyperstimulation syndrome (OHSS) symptoms (abdominal bloating, nausea, diarrhea, weight gain, vomiting, dark urine)
- Advise patient to notify prescriber of photophobia, blurred vision, diplopia, abnormal bleeding
- Teach patient if dose is missed, double at next time; if more than one dose is missed, call prescriber
- Instruct patient that response usually occurs 4-10 days after last day of treatment
- Teach patient method for taking, recording basal body temp to determine whether ovulation has occurred; if ovulation can be determined (there is a slight decrease in temp, then a sharp increase for ovulation), to attempt coitus 3 days before and every other day until after ovulation
- Teach patient if pregnancy is suspected, to notify prescriber immediately, do not use in pregnancy, breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Fertility

## clomiPRAMINE (Rx)

(klom-ip'ra-meen)
**Anafranil**
*Func. class.:* Tricyclic antidepressant
*Chem. class.:* Tertiary amine

**Do not confuse:** clomiPRAMINE/ clomiPHENE

**ACTION:** Potentiates serotonin and norepinephrine uptake; moderate anticholinergic effect

**Therapeutic outcome:** Decreased signs and symptoms of obsessive-compulsive disorder, decreased depression

**USES:** Obsessive-compulsive disorder

**Unlabeled uses:** Dysphoria, anxiety, agoraphobia and other phobias

## CONTRAINDICATIONS

Hypersensitivity to this product, carBAMazepine, tricyclics, immediately after MI, MAOI therapy

**Precautions:** Pregnancy, breastfeeding, geriatric, seizures, cardiac disease, glaucoma, prostatic hypertrophy, urinary retention

**BLACK BOX WARNING:** Suicidal ideation, children

## DOSAGE AND ROUTES

### Obsessive-compulsive disorder

**Adult:** PO 25 mg at bedtime; increase gradually over 4 wk to a dosage of 75-250 mg/day in divided doses

**Child 10-18 yr:** PO 25 mg/day gradually increased max over 2 wk 3 mg/kg/day or 200 mg/day, whichever is smaller

**Available forms:** Caps 25, 50, 75 mg

### Implementation

- Do not break, crush, or chew caps
- Give without regard to food; during initial dosing and titration, give with meals
- Store in tight container, at room temperature; do not freeze

## ADVERSE EFFECTS

**CNS:** *Dizziness, tremors, mania,* seizures, aggressiveness, drowsiness, headache, EPS, neuroleptic malignant syndrome, insomnia, agitation, anxiety, impaired memory
**CV:** Hypotension, tachycardia, cardiac arrest, hypertension, palpitations
**EENT:** Blurred vision, altered taste, tinnitus, increased intraocular pressure
**ENDO:** Galactorrhea, hyperprolactinemia
**GI:** *Constipation, dry mouth, nausea, dyspepsia,* weight gain, hepatic toxicity
**GU:** *Delayed ejaculation, anorgasmia,* retention, decreased libido
**HEMA:** Agranulocytosis, neutropenia, pancytopenia
**INTEG:** Diaphoresis, photosensitivity, abnormal skin odor, flushing, rash, pruritus
**META:** Hyponatremia
**RESP:** Pharyngitis, rhinitis, bronchospasm
**SYST:** Suicide in children/adolescents

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 20-32 hr; steady state 1-2 wk |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ≥2 wk |
| **Peak** | 2-6 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
CarBAMazepine: decreased clomiPRAMINE action
Cimetidine, FLUoxetine, fluvoxaMINE, sertraline: increased clomiPRAMINE level; do not use together
CloNIDine, EPINEPHrine, norepinephrine: severe hypertension; avoid use
CloNIDine, haloperidol, levodopa: decreased effect of droperidol, mefloquine, mesoridazine, moxifloxacin, pentamide, pimozide, tacrolimus, ziprasidone: Increased QT prolongation these products
Phenytoin: decreased clomiPRAMINE action

### Drug classifications

Barbiturates: decreased clomiPRAMINE levels
CNS depressants, general anesthetics: increased effects; do not use together
CYP1A2, CYP2D6: increased clomiPRAMINE level
**MAOIs:** hypertensive crisis, seizures; do not use together
**SSRIs, SNRIs:** increased serotonin syndrome
**Antidysrhythmics, other tricyclics, phenothiazines, quinolones:** QT prolongation
Skeletal muscle relaxants, opiates: decreased action of these products

### Drug/herb

**SAM-e, St. John's wort:** serotonin syndrome, do not use together

### Drug/lab test

Increased: prolactin, TBG, AST, ALT, blood glucose
Decreased: serum thyroid hormone ($T_3$, $T_4$)

## NURSING CONSIDERATIONS

### Assessment

- Monitor B/P (with patient lying, standing), pulse q4hr; if systolic B/P drops 20 mm Hg hold product, notify prescriber; take VS q4hr in patients with cardiovascular disease
- Monitor blood studies: CBC, leukocytes, differential, cardiac enzymes if patient is receiving long-term therapy and signs of blood dyscrasias
- **Serotonin syndrome:** hyperpyrexia, rigidity, irregular pulse, diaphoresis
- **Monitor hepatic studies:** AST, ALT, bilirubin
- Check weight weekly; appetite may increase with product
- Assess ECG for flattening of T wave, QTc prolongation bundle branch block, AV block,

dysrhythmias in cardiac patients, may lead to cardiac collapse
- Assess for EPS primarily in geriatric: rigidity, dystonia, akathisia
- **Beers:** Avoid in older adults with or at high risk for delirium or orthostatic hypotension

**BLACK BOX WARNING:** Assess mental status: mood, sensorium, affect, suicidal tendencies; increase in psychiatric symptoms: depression, panic, frequency of obsessive-compulsive behaviors

- Monitor urinary retention, constipation; constipation is more likely to occur in children or geriatric
- Assess for **withdrawal symptoms:** headache, nausea, vomiting, muscle pain, weakness; do not usually occur unless product was discontinued abruptly
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, discontinue breastfeeding or product
- Identify alcohol consumption; if alcohol is consumed, hold dose until morning

### Patient/family education
- Teach patient that therapeutic effects may take 4-6 wk
- Teach patient to use caution in driving or other activities requiring alertness because of drowsiness, dizziness, blurred vision; to avoid rising quickly from sitting to standing, especially geriatric
- Teach patient to avoid alcohol ingestion, other CNS depressants
- Teach patient not to discontinue medication quickly after long-term use: may cause nausea, headache, malaise
- Teach patient to wear sunscreen or large hat, since photosensitivity occurs
- Teach patient to increase fluids, bulk in diet if constipation, urinary retention occur, especially geriatric
- **Serotonin syndrome:** teach patient to report immediately sweating, diarrhea, twitching
- **Abrupt discontinuation:** do not stop abruptly
- Teach patient to take gum, hard sugarless candy, or frequent sips of water for dry mouth
- Advise patient to notify prescriber if pregnancy is planned or suspected

**BLACK BOX WARNING:** Teach patient that suicidal ideas, behavior may occur in children/young adults, report immediately

### Evaluation
**Positive therapeutic outcome**
- Decrease in depression
- Absence of suicidal thoughts

## TREATMENT OF OVERDOSE:
ECG monitoring, induce emesis, lavage, administer anticonvulsant

**⚠ HIGH ALERT**

## clonazePAM (Rx)
(kloe-na'zi-pam)
**KlonoPIN, Rivotril**
*Func. class.:* Anticonvulsant
*Chem. class.:* Benzodiazepine derivative
**Controlled substance schedule IV**

**Do not confuse:** clonazePAM/LORazepam/cloNIDine, KlonoPIN/cloNIDine

**ACTION:** Inhibits spike, wave formation in absence seizures (petit mal), decreases amplitude, frequency, duration, spread of discharge in minor motor seizures

**Therapeutic outcome:** Decreased frequency, severity of seizures

**USES:** Absence, atypical absence, akinetic, myoclonic seizures, Lennox-Gastaut syndrome, panic disorder

## CONTRAINDICATIONS
Pregnancy hypersensitivity to benzodiazepines, acute closed-angle glaucoma, psychosis, severe liver disease

**Precautions:** Open-angle glaucoma, chronic respiratory disease, renal/hepatic disease, breastfeeding, geriatric

## DOSAGE AND ROUTES
### Lennox-Gastaut syndrome/atypical absence seizures/akinetic and myoclonic seizures
**Adult:** PO 1.5 mg/day in 3 divided doses; may be increased 0.5-1 mg q3day until desired response; max 20 mg/day
**Child <10 yr or <30 kg:** PO 0.01-0.03 mg/kg/day in divided doses q8hr, max 0.05 mg/kg/day; may be increased 0.25-0.5 mg q3day until desired response; max 0.1-0.2 mg/kg/day
**Geriatric:** PO 0.25 daily-bid initially, increase by 0.25 daily q7-14day as needed

### Panic disorder
**Adult:** PO 0.25 mg bid, increase to 1 mg/day after 3 days, max 4 mg/day

**Available forms:** Tabs 0.5, 1, 2 mg; **orally disintegrating tabs** 0.125, 0.25, 0.5, 1, 2 mg

### Implementation

**PO route**

- Give on empty stomach for best absorption

**Rectal route**

- **IV** sol may be used rectally, 1 ml syringe inserted 3 cm into rectum
- Oral susp may be used rectally (1 mg/ml of product with 1 ml of water), use plastic tube (volume 2.2-3.3 ml)
- Store at room temperature

## ADVERSE EFFECTS

**CNS:** *Drowsiness,* dizziness, confusion, behavioral changes, tremors, insomnia, headache, suicidal tendencies, slurred speech, anterograde amnesia, fatigue, poor coordination
**CV:** Palpitations, bradycardia, tachycardia
**EENT:** *Increased salivation, nystagmus, diplopia,* abnormal eye movements
**GI:** *Nausea, constipation,* polyphagia, anorexia, xerostomia, diarrhea, gastritis, sore gums, blurred vision
**GU:** Dysuria, enuresis, nocturia, retention, libido changes
**HEMA:** Thrombocytopenia, leukocytosis, anorexia, eosinophilia
**INTEG:** Rash, alopecia, hirsutism
**RESP:** Respiratory depression, dyspnea, congestion
**MS:** Myalgia, muscle weakness

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Crosses blood-brain barrier, placenta |
| **Metabolism** | Liver, protein binding 85% |
| **Excretion** | Kidneys |
| **Half-life** | 18-50 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ½-1 hr |
| **Peak** | 1-2 hr |
| **Duration** | 6-12 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
CarBAMazepine: decreased clonazePAM effect
Cimetidine, clarithromycin, dilTIAZem, erythromycin, FLUoxetine: increased clonazePAM effect
PHENobarbitol: decreased clonazePAM effect
Phenytoin: decreased clonazePAM levels, monitor effect

### Drug classifications

Anticonvulsants, antidepressants, barbiturates, general anesthetics, opiates, sedative/hypnotics: increased CNS depression
Azoles, oral contraceptives: increased clonazePAM effect, adjust dosages
CYP3A4 inducers: decreased clonazePAM effect

### Drug/herb

Ginkgo, melatonin: increased clonazePAM effect
Ginseng, St. John's wort: decreased clonazePAM effect
Kava, chamomile, valerian: increased sedative effect

### Drug/lab test

Increased: AST, alkaline phosphatase
Decreased: platelets, WBC

## NURSING CONSIDERATIONS

### Assessment

- Assess for **blood dyscrasias:** fever, sore throat, bruising, rash, jaundice, epistaxis (long-term treatment only)
- Assess **seizures:** Monitor duration, type, intensity, with or without aura
- **Assess mental status:** mood, sensorium, affect, memory (long, short), especially geriatric; behavioral changes, suicidal thoughts/behaviors
- Assess seizure activity including type, location, duration, and character; provide seizure precaution
- Assess renal studies: urinalysis, BUN, urine creatinine
- Monitor blood studies: RBCs, Hct, Hgb, reticulocyte counts weekly for 4 wk, then monthly
- Monitor hepatic studies: ALT, AST, bilirubin, creatinine
- **Beers:** May be appropriate in older adults for seizure disorders, rapid eye movement sleep disorders, benzodiazepine/ethanol withdrawal; avoid in those with or at high risk of delirium
- **Abrupt discontinuation:** do not discontinue abruptly, seizures may increase
- Assess for signs of physical withdrawal if medication suddenly discontinued
- Assess eye problems: need for ophthalmic examinations before, during, after treatment (slit lamp, fundoscopy, tonometry)
- Assess allergic reaction: red raised rash; if this occurs, product should be discontinued
- **Monitor for toxicity:** bone marrow depression, nausea, vomiting, ataxia, diplopia, cardiovascular collapse; monitor drug levels during initial treatment (therapeutic 20-80 ng/ml)

### Patient/family education

- Teach patient to carry/wear emergency ID card stating patient's name, products taken, condition, physician's name, phone number, discuss tolerance, withdrawal, to continue with follow-up exams, lab work
- Caution patient to avoid driving, other activities that require alertness

• Caution patient to avoid alcohol ingestion or CNS depressants; increased sedation may occur
• Teach patient not to discontinue medication quickly after long-term use; taper off over several weeks

**Pregnancy/breastfeeding:**
• Teach patient to notify prescriber if pregnancy is planned or suspected or if breastfeeding to register with North American Antiepileptic Drug Pregnancy Registry 888-233-2334, do not use in pregnancy/breastfeeding
• Teach patient to notify prescriber of yellowing skin/eyes, pale stools, bleeding, fever, extreme fatigue, sore throat, suicidal thoughts/behaviors
• Teach patient to notify prescriber immediately if suicidal thoughts, behaviors occur

### Evaluation
**Positive therapeutic outcome**
• Decreased seizure activity

## TREATMENT OF OVERDOSE:
Lavage, VS, flumazenil, monitor electrolytes, sodium bicarbonate

## cloNIDine (Rx)
(klon'i-deen)
**Catapres, Catapres-TTS, Dixanit, Diyaril, Duraclon, Kapvay**
*Func. class.:* Antihypertensive, centrally acting analgesic
*Chem. class.:* Centrally acting α-adrenergic agonist

**Do not confuse:** cloNIDine/KlonoPIN/clonazePAM

**ACTION:** Inhibits sympathetic vasomotor center in CNS, which reduces impulses in sympathetic nervous system; B/P, pulse rate, cardiac output decreased; prevents pain signal transmission in CNS by α-adrenergic receptor stimulation of the spinal cord

**Therapeutic outcome:** Decreased B/P in hypertension

**USES:** Mild to moderate hypertension, used alone or in combination; severe pain in cancer patients (epidural), attention-deficit/hyperactivity disorder (ADHD)

**Unlabeled uses:** Opioid withdrawal, prevention of vascular headaches, treatment of menopausal symptoms, dysmenorrhea, attention-deficit/hyperactivity disorder (ADHD), autism, cycloSPORINE nephrotoxicity prophylaxis, diabetic neuropathy, ethanol/nicotine/opiate agonist withdrawal, Tourette's syndrome, hypertensive emergency, neonatal abstinence syndrome, scleroderma renal crisis

## CONTRAINDICATIONS
Hypersensitivity; (epidural) bleeding disorders, anticoagulants

**Precautions:** Pregnancy, breastfeeding, child <12 yr (transdermal), geriatric, MI (recent), diabetes mellitus, chronic renal failure, Raynaud's disease, thyroid disease, depression, COPD, asthma, noncompliant patients

**BLACK BOX WARNING:** Labor (transdermal)

## DOSAGE AND ROUTES
### Hypertension
**Adult:** PO 0.1 mg bid, then increase by 0.1-0.2 mg/day at weekly intervals, until desired response; range 0.2-0.6 mg/day in divided doses or transdermal **q7 days,** start 0.1 mg and adjust q1-2wk
**Geriatric:** PO 0.1 mg at bedtime, may increase gradually
**Child:** PO 5-10 mcg/kg/day in divided doses q8-12hr, max 0.9 mg/day

### Opioid withdrawal (unlabeled)
**Adult:** PO 0.3-1.2 mg/day; may decrease by 50% × 3 days, then decrease by 0.1-0.2 mg/day or discontinue

### Severe pain
**Adult:** CONT EPIDURAL INF 30 mcg/hr
**Child:** CONT EPIDURAL INF 0.5 mcg/kg/hr, then titrate to response

### Menopausal symptoms (unlabeled)
**Adult:** TD 0.1 mg patch q1wk; PO 0.05-0.4 mg daily

### ADHD/TIC disorders in children/autism (unlabeled)
**Adolescent/child ≥6 yr:** PO 0.05 mg/kg/day in 3-4 divided doses; may increase by 0.1 mg/day qwk up to 0.4 mg/day; EXT REL (Kapvay): 0.1 mg at bedtime, increase dose by 0.1 mg/day up to 0.4 mg/day

### Tourette's syndrome (unlabeled)
**Adult:** PO 0.15-0.2 mg/day

**Available forms:** Tabs 0.025, 0.1, 0.2, 0.3 mg; transdermal sys 2.5, 5, 7.5 mg delivering 0.1, 0.2, 0.3 mg/24 hr, respectively; inj 100, 500 mcg/ml, ext rel tab 0.1 mg (Kapvay), 0.17 mg (Nexiclon)

### Implementation
**PO route**
• Give last dose at bedtime
• Do not crush, cut, chew, or break ER tabs; Kapvay is not interchangeable with other products

**Transdermal route**
• Apply patch weekly; remove old patch and wash off residue; apply to site without hair; best absorption over chest or upper arm; rotate sites with each application; clean site before application; apply firmly, especially around edges, may secure with adhesive tape if loose; fold sticky sides together and discard
• Should be removed before MRI
• Store patches in cool environment, tabs in tight container

**BLACK BOX WARNING:** Do not use for labor

## ADVERSE EFFECTS

**CNS:** *Drowsiness, sedation, headache, fatigue,* nightmares, insomnia, mental changes, anxiety, depression, hallucinations, delirium, syncope, dizziness
**CV:** *Orthostatic hypotension, palpitations,* HF, ECG abnormalities, sinus tachycardia
**EENT:** Taste change, parotid pain
**ENDO:** Hyperglycemia
**GI:** *Nausea, vomiting, malaise,* constipation, *dry mouth*
**GU:** Impotence, dysuria, *nocturia,* gynecomastia
**INTEG:** *Rash,* alopecia, facial pallor, pruritus, hives, edema, burning papules, excoriation (TD patches)
**MISC:** *Withdrawal symptoms*
**MS:** Muscle, joint pain, leg cramps

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO, TD) |
| **Distribution** | Widely distributed; crosses blood-brain barrier |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys, unchanged (45%) |
| **Half-life** | 12-21 hr |

### Pharmacodynamics

| | PO | TD |
|---|---|---|
| **Onset** | ½-1 hr | 3 days |
| **Peak** | 2-4 hr | Unknown |
| **Duration** | 8-12 hr | 8 hr (after removal) |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
Levodopa: decreased levodopa effect
Prazosin: decreased hypotensive effects
Verapamil, dilTIAZem: AV block

### Drug classifications

Amphetamines, appetite suppressants, MAOIs, tricyclics: decreased hypotensive effects
Increase: Bradycardia, amphetamines, beta blockers, digoxin, dilTIAZem, MAOI inhibitors, verapamil
Anesthetics, opiates, sedatives/hypnotics: increased CNS depression
Antidepressants (tricyclic), β-adrenergic blockers: life-threatening increase in B/P
Diuretics, nitrates: increased hypotensive effects

### Drug/herb

Aconite: increased toxicity, death
Ephedra, ginseng: decreased antihypertensive effect
Hawthorn: increased antihypertensive effect

### Drug/lab test

Increased: blood glucose
Decreased: VMA, urinary catecholamines, aldosterone
Positive: Coomb's test

## NURSING CONSIDERATIONS

### Assessment

• Assess **cancer pain:** location, intensity, character, alleviating, aggravation factors, baseline and frequency
• Perform blood studies: neutrophils, decreased platelets
• **Perform renal studies:** protein, BUN, creatinine; watch for increased levels that may indicate nephrotic syndrome: polyuria, oliguria, frequency
• Monitor baselines for renal/liver function tests before therapy begins; check potassium levels, although hyperkalemia rarely occurs
• Monitor B/P, pulse if the product is being used for **hypertension;** notify prescriber of changes
• Assess for **opiate withdrawal** (unlabeled) in patients receiving the product for opioid withdrawal, including fever, diarrhea, nausea, vomiting, cramps, insomnia, shivering, dilated pupils, weakness
• Check for edema in feet, legs daily; monitor I&O; check for decreasing output
• Assess **allergic reaction:** rash, fever, pruritus, urticaria; product should be discontinued if antihistamines fail to help
• ADHD: monitor B/P, pulse, palpitations, syncope
• Assess for symptoms of **HF:** edema; dyspnea, wet crackles, B/P, weight gain, report significant changes, more common in the elderly

**BLACK BOX WARNING:** Pregnancy/breastfeeding: Do not use for labor (epidural), excreted in breast milk, discontinue breastfeeding or product

• **Beers:** Avoid as first line in older adults, high risk of CNS effects, bradycardia, orthostatic hypotension

### Patient/family education

• **Instruct patient not to discontinue product abruptly, or withdrawal symptoms may occur:** anxiety, increased B/P, headache, insomnia, increased pulse, tremors, nausea, sweating
• Caution patient not to use OTC (cough, cold, or allergy), alcohol or CNS depressant products unless directed by prescriber
• Teach patient to comply with dosage schedule even if feeling better; product controls symptoms, does not cure
• Caution patient to change position slowly, to rise slowly to sitting or standing position to minimize orthostatic hypotension, especially geriatric
• Instruct patient to notify physician of mouth sores, sore throat, fever, swelling of hands or feet, irregular heartbeat, chest pain, signs of angioedema, increased weight
• Teach patient about excessive perspiration, dehydration, vomiting; diarrhea may lead to fall in B/P; consult prescriber if these occur
• Tell patient that product may cause dizziness, fainting; light-headedness may occur during first few days of therapy; use hard candy, saliva product, or frequent rinsing of mouth for dry mouth
• **Transdermal:** teach patient how to use patch; that patch comes in two parts: product patch and overlay to keep patch in place; not to trim or cut patch; remove for MRI; can use during bathing, swimming
• Advise patient that compliance is necessary; not to skip or stop product unless directed by prescriber
• Teach patient that product may cause skin rash or impaired perspiration
• Teach patient that response may take 2-3 days if product is given TD; instruct on administration of patch; return demonstration
• Teach patient to avoid hazardous activities, since product may cause drowsiness, dizziness
• Teach patient to administer 1 hr before meals

### Evaluation

**Positive therapeutic outcome**

• Decrease in B/P in hypertension
• Decrease in withdrawal symptoms
• Decrease in pain
• Decrease in vascular headaches
• Decrease in dysmenorrhea
• Decrease in menopausal symptoms

## TREATMENT OF OVERDOSE:

Supportive treatment; administer atropine, DOPamine prn

**⚠ HIGH ALERT**

## clopidogrel (Rx)

(klo-pid'oh-grel)

**Plavix**

*Func. class.:* Platelet aggregation inhibitor
*Chem. class.:* Thienopyridine derivative

**Do not confuse:** Plavix/Paxil/Elavil

## ACTION:

Inhibits first and second phases of ADP-induced effects in platelet aggregation

**Therapeutic outcome:** Decreased possibility of stroke, MI by decreasing platelet aggregation

## USES:

Reducing the risk of stroke, MI, vascular death, peripheral arterial disease in high-risk patients, acute coronary syndrome, transient ischemic attack (TIA), unstable angina

## CONTRAINDICATIONS

Hypersensitivity, active bleeding

**Precautions:** Pregnancy, breastfeeding, children, past liver disease, increased bleeding risk, neutropenia, agranulocytosis, renal disease, Asian/Black/Caucasian patients

**BLACK BOX WARNING:** CYP2C19 allele (poor metabolizers)

## DOSAGE AND ROUTES

### Recent MI, stroke, peripheral arterial disease, TIA

**Adult:** PO 75 mg daily with aspirin

### Acute coronary syndrome

**Adult:** PO loading dose 300 mg then 75 mg daily with aspirin

**Available forms:** Tabs 75, 300 mg

### Implementation

• Give with food to decrease gastric symptoms
• Product should be discontinued 5 days before elective surgery if an antiplatelet action is not desired

## ADVERSE EFFECTS

**CNS:** Headache, dizziness, depression, confusion, hallucinations, fatal intracranial bleeding
**CV:** Edema, hypertension, chest pain
**GI:** Nausea, vomiting, diarrhea, GI discomfort, GI bleeding, pancreatitis, hepatic failure
**GU:** Glomerulonephritis

**HEMA:** *Epistaxis,* purpura, bleeding (major/minor from any site), neutropenia, aplastic anemia, agranulocytosis, thrombotic thrombocytopenic purpura
**INTEG:** Rash, pruritus
**MISC:** UTI, hypercholesterolemia, chest pain, fatigue, intracranial hemorrhage, toxic epidermal necrolysis, Stevens-Johnson syndrome, flu-like syndrome, anaphylaxis
**MS:** Arthralgia, back pain
**RESP:** Upper respiratory tract infection, dyspnea, rhinitis, bronchitis, cough, bronchospasm

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Liver, extensively, protein binding 95%, CYP2B6, CYP1A2, CYP2C8 |
| **Excretion** | Kidneys, unchanged product |
| **Half-life** | 6 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Abciximab, aspirin, eptifibatide, rifAMPin, ticlopidine, tirofiban, treprostinil, SNRIs, prasugrel: increased bleeding tendencies
Fluvastatin, phenytoin, tamoxifen, TOLBUTamide, torsemide, warfarin: increased action of each specific product

### Drug classifications

Anticoagulants, NSAIDs, SSRIs, thrombolytics: increased bleeding tendencies
CYP3A4 inhibitors/substrates (atorvastatin, cerivastatin, esomeprazole, omeprazole, simvastatin): decreased effects

**BLACK BOX WARNING:** CYP2C19 inhibitors (omeprazole, esomeprazole): avoid use

NSAIDs: increased action of some NSAIDs
Proton pump inhibitors (PPIs): decreased clopidogrel effect

### Drug/herb

Bilberry, saw palmetto: decreased clopidogrel effect
Feverfew, fish oil, garlic, ginger, ginkgo biloba, green tea, horse chestnut, omega-3 fatty acids: increased clopidogrel effect

### Drug/lab test

Increased: AST, ALT, bilirubin, uric acid, total cholesterol, nonprotein nitrogen (NPN)

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** CYP2C19 allele (poor metabolizers): Consider using another antiplatelet product, higher CV reaction occurs after acute coronary syndrome or PCI, tests are available to determine CYP2C19 allele

- Assess for thrombotic/thrombocytic purpura: fever, thrombocytopenia, neurolytic anemia
- Monitor liver function tests: AST, ALT, bilirubin, creatinine if patient is on long-term therapy (4 mo or more)
- Monitor blood studies: CBC, Hct, Hgb, protime, cholesterol if patient is on long-term therapy; thrombocytopenia, hemolytic anemia, neurologic changes occur (rare)

### Patient/family education

- **Pregnancy/breastfeeding:** Use only if clearly needed
- Advise patient that blood work will be necessary during treatment
- Advise patient to report any unusual bleeding to prescriber, that it may take longer to stop bleeding
- Teach patient to take without regard to food
- Caution patient to report diarrhea, skin rashes, subcutaneous bleeding, chills, fever, sore throat, yellowing of skin, eyes, weakness
- Teach patient to tell all health care providers that clopidogrel is being used; may be held for 5 days before surgery, restart as soon as remembered
- **Pregnancy/breastfeeding:** If pregnancy is planned or suspected, if breastfeeding, do not breastfeed
- **Hypersensitivity:** Rash, angioedema may occur

### Evaluation

**Positive therapeutic outcome**

- Absence of stroke

## clotrimazole topical

*See Appendix B*

## clotrimazole vaginal antifungal

*See Appendix B*

## cloZAPine (Rx)

(kloz'a-peen)
**Clozaril, Fazaclo, Versacloz**
*Func. class.:* Antipsychotic
*Chem. class.:* Tricyclic dibenzodiazepine derivative

**Do not confuse:** Clozaril/Colazal/cloZAPine/cloNIDine/clofazimine/clonazePAM/KlonoPIN

**ACTION:** Interferes with DOPamine receptor binding with lack of EPS and tardive dyskinesia; also acts as an adrenergic, cholinergic, histaminergic, serotoninergic antagonist

**Therapeutic outcome:** Decreased psychotic behavior

**USES:** Management of psychotic symptoms in schizophrenic patients for whom other antipsychotics have failed, recurrent suicidal behavior; orally disintegrating tabs are not used for recurrent suicidal behavior

**Unlabeled uses:** Agitation, bipolar disorder, dementia, psychosis in Parkinson's disease

## CONTRAINDICATIONS

Hypersensitivity, severe granulocytopenia (WBC $<3500/mm^3$ before therapy), comaileus

**Precautions:** Pregnancy, breastfeeding, children <16 yr, geriatric, renal/hepatic/cardiac/CV/pulmonary disease, seizures, prostatic enlargement, closed-angle glaucoma, stroke

**BLACK BOX WARNING:** Bone marrow suppression, hypotension, myocarditis, orthostatic hypotension, elderly patients with dementia-related psychosis, seizures, syncope

## DOSAGE AND ROUTES

### Schizophrenia

**Adult:** PO 12.5 mg daily or bid; may increase by 25-50 mg/day; normal range 300-450 mg/day 1-2 ×/wk; do not increase dosage more than 2 times/wk; dose > 500 mg requires 3 divided doses; max 900 mg/day; use lowest dosage to control symptoms; if dose is to be discontinued, taper over 1-2 wk

**Adolescent, child ≥9 yr (unlabeled):** PO 6.25-12.5 mg initially slowly titrate

### Dementia with multiple behavioral disturbances (unlabeled)

**Geriatric:** PO 12.5 mg qd at bedtime, may increase by 12.5 mg every other day; max 50 mg/day

**Available forms:** Tabs 12.5, 25, 50, 100, 200 mg; orally disintegrating tabs 12.5, 25, 100 150, 200 mg; oral suspension 50 mg/ml

### Implementation

- Decrease dosage in geriatric since metabolism is slowed
- Give with full glass of water, milk; or give with food to decrease GI upset
- Store in tight, light-resistant container; oral sol in amber bottle
- Patient-specific registration is required before administration; if WBC <3500 cells/$mm^3$ or ANC <2000 cells/$mm^2$, therapy should not be started, pharmacist may only dispense the 7, 14, 28 day supply upon receipt of lab report that is appropriate
- **Orally disintegrating tab:** do not push through foil, leave in foil blister until ready to take, peel back foil, place tab in mouth, allow to dissolve, swallow; water is not needed
- **Oral suspension:** Shake before using, use oral syringe and syringe adapter

## ADVERSE EFFECTS

**CNS:** *Sedation, salivation, dizziness, headache, tremors, sleep problems, akinesia, fever,* seizures, *sweating, akathisia, confusion, fatigue, insomnia, depression, slurred speech, anxiety,* neuroleptic malignant syndrome, agitation, dystonia, obsessive-compulsive symptoms

**CV:** *Tachycardia, hypo/hypertension,* chest pain, ECG changes, orthostatic hypotension

**EENT:** Blurred vision

**GI:** *Drooling or excessive salivation, constipation, nausea, abdominal discomfort, vomiting, diarrhea,* anorexia, weight gain, dry mouth, heartburn, dyspepsia, gastroesophageal reflux

**GU:** *Urinary abnormalities,* incontinence, ejaculation dysfunction, frequency, urgency, retention, dysuria

**HEMA:** Leukopenia, neutropenia, agranulocytosis, eosinophilia

**MS:** Weakness; pain in back, neck, legs; spasm; rigidity

**RESP:** Dyspnea, nasal congestion, lower respiratory tract infection

**OTHER:** Diaphoresis

**SYST:** Death in geriatric patients with dementia, aggravation of diabetes mellitus

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed; crosses blood-brain barrier, placenta; 95% protein binding |
| **Metabolism** | Liver, CYP1A2, 2D6, 3A4 |
| **Excretion** | Kidneys (50%), feces (30%) (metabolites) |
| **Half-life** | 8-12 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | 8-12 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
Caffeine, citalopram, erythromycin, FLUoxetine, fluvoxaMINE, ketoconazole, risperiDONE, ritonavir, sertraline: increased cloZAPine levels
CarBAMazepine, omeprazole, PHENobarbital, rifAMPin: decreased cloZAPine level
Digoxin: increased plasma concentration of digoxin
Warfarin: increased plasma concentrations

### Drug classifications

Benzodiazepines: increased hypotension, respiratory, cardiac arrest, collapse
Increase: Bone marrow suppression: antineoplastic radiation therapy
Increase: Seizures: lithium
β-blockers, class IA/III antidysrhythmics, and other drugs that increase QT: increased QT prolongation
CNS depressants, psychoactives, antihistamines, opioids, sedatives/hypnotics: increased CNS depression
CYPIA2 inducers: decreased cloZAPine levels
CYP1A2 inhibitors, CYP3A4 inhibitors: increased cloZAPine level
Highly protein-bound products: increased plasma concentrations

### Drug/food

Caffeine: increased cloZAPine levels

### Drug/lab test

Increased: Triglycerides, cholesterol, blood glucose
Decreased: WBC
False positive: pregnancy tests, PKU
False negative: urinary steroids, 17-OHCS

## NURSING CONSIDERATIONS

### Assessment

- Assess for **myocarditis** if suspected, discontinue; myocarditis usually occurs during first month of treatment
- AIMS assessment, blood glucose, CBC differential, glycosylated hemoglobin A1C, LFTs, neurologic function, pregnancy test, serum creatinine, electrolytes, lipid profile, prolactin, thyroid function tests, weight

**BLACK BOX WARNING:** Assess for **seizures;** usually occurs with higher doses (>600 mg/day) or dosage change >100 mg/day; do not use in uncontrolled seizure disorder; use cautiously in those with a predisposition to seizures

- Assess mental status: orientation, mood, behavior, presence of hallucinations, and type before initial administration and monthly; this product should significantly reduce psychotic behavior
- Check for swallowing of PO medication; check for hoarding or giving of medication to other patients

**BLACK BOX WARNING: Bone marrow depression:** Monitor bilirubin, CBC, liver function test monthly; discontinue treatment if WBC <3000-3500/mm$^3$ or if ANC <1500/mm$^3$; test qwk; may resume when normal; if WBC <2000/mm$^3$ or ANC <1000/mm$^3$, discontinue; if agranulocytosis develops, never restart product

- Assess affect, orientation, LOC, reflexes, gait, coordination, sleep pattern disturbances

**BLACK BOX WARNING: Hypotension, bradycardia, syncope:** Monitor B/P with patient sitting, standing, and lying; take pulse and respirations q4hr during initial treatment; establish baseline before starting treatment; report drops of 30 mm Hg

- Check for dizziness, faintness, palpitations, tachycardia on rising
- **Assess for neuroleptic malignant syndrome:** hyperpyrexia, muscle rigidity, increased CPK, altered mental status; product should be discontinued
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, do not breastfeed
- **Beers:** Avoid in older adults except for schizophrenia, bipolar disorder, increased risk of stroke and cognitive decline
- Assess for **EPS** including akathisia (inability to sit still, no pattern to movements), tardive dyskinesia (bizarre movements of the jaw, mouth, tongue, extremities), pseudoparkinsonism (rigidity, tremors, pill rolling, shuffling gate)
- Assess for constipation, urinary retention daily; if these occur, increase bulk, water in diet

### Patient/family education

- Teach patient to use good oral hygiene; frequent rinsing of mouth, sugarless gum for dry mouth
- Caution patient to avoid hazardous activities until product response is determined
- Inform patient that orthostatic hypotension occurs often and to rise from sitting or lying position gradually
- Caution patient to avoid hot tubs, hot showers, tub baths, since hypotension may occur

• Teach patient to avoid OTC preparations (cough, hay fever, cold) unless approved by prescriber, since serious product interactions may occur; avoid use with alcohol, CNS depressants; increased drowsiness may occur
• Teach patient about EPS and necessity of meticulous oral hygiene, since oral candidiasis may occur
• Teach patient to report sore throat, malaise, fever, bleeding, mouth sores; if these occur, CBC should be performed and product discontinued
• Advise patient that in hot weather, heat stroke may occur; take extra precautions to stay cool

**BLACK BOX WARNING:** Teach patient symptoms of agranulocytosis and need for blood test qwk for 6 mo, then q2wk; report flulike symptoms

### Evaluation

**Positive therapeutic outcome**

• Decrease in emotional excitement, hallucinations, delusions, paranoia
• Reorganization of patterns of thought, speech

**TREATMENT OF ANAPHYLAXIS:** Withdraw product, maintain airway; if diabetic, check blood glucose levels

**⚠ HIGH ALERT**

## codeine (Rx)

(koe′deen)

*Func. class.:* Opiate, phenanthrene derivative

**Controlled substance schedule II, III, IV, V (depends on content)**

**Do not confuse:** codeine/Lodine/Iodine

**ACTION:** Depresses pain impulse transmission at the spinal cord level by interacting with opioid receptors; decreases cough reflex, GI motility

**Therapeutic outcome:** Pain relief, decreased cough, decreased diarrhea depending on route

**USES:** Mild to moderate to severe pain

**Unlabeled uses:** Diarrhea, nonproductive cough

## CONTRAINDICATIONS

Hypersensitivity to opiates, respiratory depression, increased intracranial pressure, seizure disorders, severe respiratory disorders, breastfeeding

**BLACK BOX WARNING:** Children (tonsillectomy/adenoidectomy), ultra-rapid metabolizers

**Precautions:** Pregnancy, geriatric, cardiac dysrhythmias, prostatic hypertrophy, bowel impaction

## DOSAGE AND ROUTES

### Pain

**Adult:** PO IM/IV/SUBCUT 15-60 mg q4hr prn; use phosphate product for IM/IV
**Child:** PO 6-17 yr 3 mg/kg/day in divided doses q4hr prn

### Renal dose

**Adult:** PO CCr 10-50 ml/min 75% of dose; CCr <10 ml/min 50% of dose

### Cough (unlabeled)

**Adult:** PO 10-20 mg q4-6hr, max 120 mg/day

### Diarrhea (unlabeled)

**Adult:** PO 30 mg; may repeat qid prn

**Available forms:** Tabs 15, 30 mg; oral sol 30, 60 mg/5 ml; inj 15, 30 mg/ml; syrup 5 mg/ml

### Implementation

• Give with antiemetic if nausea, vomiting occur
• Administer when pain is beginning to return, determine dosage interval by patient response; continuous dosing of medication is more effective given prn; explain analgesic effect
• Medication should be slowly withdrawn after long-term use to prevent withdrawal symptoms, use stool softener, laxative for constipation
• Store in light-resistant container at room temp

**PO route**

• May be given with food or milk to lessen GI upset

**IM/SUBCUT route**

• Do not give if cloudy, or a precipitate has formed

## ADVERSE EFFECTS

**CNS:** *Drowsiness, sedation,* dizziness, agitation, dependency, lethargy, restlessness, euphoria, seizures, hallucinations, headache, confusion
**CV:** Bradycardia, palpitations, orthostatic hypotension, tachycardia, circulatory collapse
**GI:** *Nausea, vomiting, anorexia, constipation,* dry mouth
**GU:** Urinary retention
**INTEG:** Flushing, rash, urticaria, pruritus
**RESP:** Respiratory depression, respiratory paralysis, dyspnea
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Bioavailability 60%-90% |
| **Distribution** | Widely distributed; crosses placenta, protein binding 7% |
| **Metabolism** | Liver, extensively by CYP3A4 to morphine; altered in ethnic groups |
| **Excretion** | Kidneys (up to 15%), breast milk |
| **Half-life** | 3-4 hr |

### Pharmacodynamics

| | PO | IM | SUBCUT |
|---|---|---|---|
| **Onset** | 30-60 min | 30-60 min | 15-30 min |
| **Peak** | 1-2 hr | 30-60 min | Unknown |
| **Duration** | 4 hr | 4 hr | 4 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression

### Drug classifications

Antipsychotics, CYP2D6, sedative, hypnotics, opiates, skeletal muscle relaxants: increased CNS depression

MAOIs: increased toxicity; use cautiously

### Drug/lab test

Increased: amylase, lipase

Decrease: Opioid effect: opioid antagonists

## NURSING CONSIDERATIONS

### Assessment

- Assess **pain:** intensity, type, alleviating factors, type, location, need for pain medication, tolerance, use pain scoring
- Assess GI function: nausea, vomiting, constipation
- Assess **cough:** type, duration, ability to raise secretion for productive cough; do not use to suppress a productive cough
- Monitor VS after parenteral route; note muscle rigidity, product history, renal/hepatic function tests, respiratory dysfunction: respiratory depression, character, rate, rhythm; notify prescriber if respirations are <10/min
- Monitor CNS changes: dizziness, drowsiness, hallucinations, euphoria, LOC, pupil reaction

**BLACK BOX WARNING:** Child (tonsillectomy/adenoidectomy) and are ultra-rapid metabolizers: deaths have occurred, use is contraindicated

- Monitor allergic reactions: rash, urticaria
- Respiratory dysfunction: respiratory depression, character, rate, rhythm; notify prescriber if respirations are <10/min, shallow
- **Beers:** Avoid in older adults unless safer alternative is not available, may cause ataxia, impaired psychomotor function

### Patient/family education

- Teach patient to report any symptoms of CNS changes, allergic reactions; to avoid CNS depressants: alcohol, sedative/hypnotics for at least 24 hr after taking this product
- Discuss with patient that dizziness, drowsiness, and confusion are common
- Advise patient to avoid getting up without assistance
- Discuss in detail with patient all aspects of the product
- Teach patient to use increased fiber in diet, water for constipation
- Teach patient that physical dependency may result after extended periods
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, infants born to those using opioids are at risk of neonatal opiate withdrawal, do not breastfeed

### Evaluation

**Positive therapeutic outcome**

- Decreased pain
- Decreased cough
- Decreased diarrhea

## TREATMENT OF OVERDOSE:

Naloxone 0.4 ampule diluted in 10 ml 0.9% NaCl and given by direct **IV** push 0.02 mg q2min (adult)

## colchicine (Rx)

(kol'chih-seen)

**Colcrys, ColciGel, Mitigare**

*Func. class.:* Antigout agent

*Chem. class.:* *Colchicum autumnale* alkaloid

**Do not confuse colchicine/Cortrosym**

**ACTION:** Inhibits microtubule formation of lactic acid in leukocytes, which decreases phagocytosis and inflammation in joints

**Therapeutic outcome:** Decreased pain, inflammation of joints

**USES:** Gout, gouty arthritis (prevention, treatment); to arrest progression of neurologic disability in multiple sclerosis

**Unlabeled uses:** Hepatic cirrhosis, familial Mediterranean fever, pericarditis, amyloidosis, Behçet's syndrome, biliary cirrhosis, dermatitis herpetiformis, idiopathic thrombocytopenic purpura, Paget's disease, pseudogout, pulmonary fibrosis

## CONTRAINDICATIONS

Hypersensitivity; serious GI disorders, severe renal/hepatic/cardiac disorders

**Precautions:** Pregnancy, breastfeeding, children, geriatric, blood dyscrasias, hepatic disease

## DOSAGE AND ROUTES

### Gout prevention

**Adult:** PO 0.6-1.8 mg in 1-2 divided doses daily depending on severity

### Gout treatment

**Adult:** PO 1.2 mg initially, then 0.6 mg 1 hr later (1.8 mg); those on strong CYP3A4 inhibitor (past 14 days) 0.6 mg initially, then 0.3 mg 1 hr later

### Renal dose

**Adult:** PO CCr <30 ml/min for acute gout, do not repeat course for 2 wk; familial Mediterranean fever 0.3 mg daily, increase cautiously

### Pericarditis (unlabeled)

**Adult:** PO 0.5 mg bid

### Mediterranean fever (unlabeled)

**Adult:** PO (on no interacting products): 1.2-2.4 mg/day in 1-2 divided doses; *strong CYP3A4 inhibitor/increase cautiously; P-glycoprotein inhibitors within 14 days:* max 0.6 mg/day in 1-2 divided doses; *moderate CYP3A4 inhibitors with 14 day max* 1.2 mg/day in 1-2 divided doses

**Adolescent:** PO 1.2-2.4 mg/day in 1-2 divided doses, titrate by 0.3 mg/day

**Child 6-12 yr:** PO 0.9-1.8 mg/day in 1-2 divided doses

**Child 4-6 yr:** PO 0.3-1.8 mg/day in 1-2 divided doses

**Available forms:** Tabs 0.6 mg; caps 0.6 mg; topical route

### Implementation

**PO route**

- Give without regard to food
- Cumulative doses ≤4 mg, renal patients ≤2 mg, when reached, administer only for 3 wks

## ADVERSE EFFECTS

**GI:** *Nausea, vomiting, anorexia, malaise,* metallic taste, cramps, peptic ulcer, diarrhea
**GU:** Hematuria, oliguria, renal damage
**HEMA:** Agranulocytosis, thrombocytopenia, aplastic anemia, pancytopenia
**INTEG:** Chills, dermatitis, pruritus, purpura, erythema
**MISC:** Myopathy, alopecia, reversible azoospermia, peripheral neuritis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | WBCs |
| **Metabolism** | Deacetylates in liver |
| **Excretion** | Feces (metabolites/active product) |
| **Half-life** | 4.4 hr |

### Pharmacodynamics

| | PO |
|---|---|
| **Onset** | Unknown |
| **Peak** | ½-2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

CycloSPORINE, radiation: increased bone marrow depression
Ethanol: increased GI effects
Vitamin $B_{12}$: decreased action of vit $B_{12}$; may cause reversible malabsorption

### Drug classifications

Bone marrow depressants: increased bone marrow depression
HMG-COA reductase inhibitors Increase: rhabdomyolysis
Moderate/strong CYP3A4 inhibitors, (atazanavir, clarithromycin, indinavir, itraconazole, ketoconazole, ritonavir, saquinavir, telithromycin); P-glycoprotein inhibitors reduce dose: increased colchicine level/toxicity
NSAIDs: increased GI effects

### Drug/food

Grapefruit juice: increased colchicine level

### Drug/lab test

Increased: alkaline phosphatase, AST
Decreased: platelets, WBC, granulocytes
False positive: urine Hgb
Interference: urinary 17-hydroxycorticosteroids

## NURSING CONSIDERATIONS

### Assessment

- **Gout:** Assess pain and mobility of joints, uric acid levels returning to normal, monitor response to treatment q1hr
- Familial Mediterranean fever: Chest pain, fever, joint pain, lesions, baseline and periodically monitor I&O ratio; observe for decrease in urinary output; CBC, platelets, reticulocytes before, during therapy (q3mo); may cause aplastic anemia, agranulocytosis, decreased platelets
- **Assess for toxicity:** weakness, abdominal pain, nausea, vomiting, diarrhea, product should be discontinued, report symptoms immediately

• **Beers:** Reduce dose in older adults, monitor for adverse reactions
• **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected

### Patient/family education

• Caution patient to avoid alcohol, OTC preparations that contain alcohol
• Instruct patient to report any pain, redness, or hard area, usually in legs; rash, sore throat, fever, bleeding, bruising, weakness, numbness, tingling, nausea, vomiting, abdominal pain, muscle pain, weakness
• **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, neonatal codeine withdrawal may occur, don't use in labor (premature infant), excreted in breast milk, avoid breastfeeding
• Teach patient importance of complying with medical regimen (diet, weight loss, product therapy); bone marrow depression may occur
• Advise patient to tell all providers of product use, surgery may increase possibility of acute gout symptoms

### Evaluation

**Positive therapeutic outcome**

• Decreased stone formation on x-ray
• Decreased pain in kidney region
• Absence of hematuria
• Decreased pain in joints, reduced familial Mediterranean fever episodes

## TREATMENT OF OVERDOSE:

Discontinue medication, may need opioids to treat diarrhea

## colesevelam (Rx)

(coal-see-vel'am)
**Welchol**
*Func. class.:* Antilipemic
*Chem. class.:* Bile acid sequestrant

**ACTION:** Adsorbs, combines with bile acids to form insoluble complex that is excreted through feces; loss of bile acids lowers cholesterol levels

**Therapeutic outcome:** Decreasing LDL cholesterol

**USES:** Elevated LDL cholesterol, alone or in combination with HMG-coA reductase inhibitor; type 2 diabetes (adjunct)

## CONTRAINDICATIONS

Hypersensitivity, bowel disease, primary biliary cirrhosis, triglycerides >300 mg/dl, bowel obstruction, pancreatitis, biliary obstruction; dysphagia, fat-soluble vitamin deficiency

**Precautions:** Pregnancy, breastfeeding, children

C

## DOSAGE AND ROUTES

### Monotherapy

**Adult:** PO 3 625 mg tabs bid with meals or 6 tabs daily with a meal; may increase to 7 tabs if needed

### Combination therapy

**Adult:** PO 3 tabs bid with meals or 6 tabs daily with a meal given with an HMG-coA reductase inhibitor

### Type 2 diabetes, adjunct (to improve glycemic control)

**Adult and geriatric:** PO approx 3.8 g (6 tabs)/day or approx 1.9 g (3 tabs) bid

### Heterozygous familial hypercholesterolemia

**Females (postmenarchal and >10 yr) and males ≥10 yr:** PO 1.875 g packet bid or 3.75 g packet q day dissolved in 4-8 oz of water with a meal

**Available forms:** Tabs 625 mg, powder for oral susp 3.75 g/packet

### Implementation

• Give product daily, bid with meals; give all other medications 4 hr before colesevelam to avoid poor absorption; take with liquid
• Give supplemental doses of vit A, D, K if levels are low

**Powder for oral susp**

• Empty contents of packet into a cup/glass; add ½-1 cup (4-8 oz) of water, fruit juice, or diet soda; stir well before drinking

## ADVERSE EFFECTS

**GI:** *Constipation, abdominal pain, nausea,* fecal impaction, hemorrhoids, flatulence, vomiting, GI obstruction
**MISC:** Hypertriglycerides, hypoglycemia
**MS:** Muscle, joint pain

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Feces |
| **Half-life** | Unknown |

### Pharmacodynamics

LDL decreased in 4-7 days

## INTERACTIONS

### Individual drugs

Digoxin, dilTIAZem, gemfibrozil, glyBURide, fluoroquinolones, iron, mycophenolate, penicillin G, phenytoin, propanolol, warfarin: decreased absorption of each specific product

Thyroid hormones: decreased absorption of thyroid

### Drug classifications

Corticosteroids: decreased corticosteroid action

Oral contraceptives: decreased action of oral contraceptives, give ≥ 4 hr before colesevelam

Tetracyclines: decreased absorption of tetracyclines

Thiazides: decreased absorption of thiazides

Vitamins (fat-soluble): decreased absorption of fat-soluble vitamins

### Drug/lab test

Increased: liver function tests

## NURSING CONSIDERATIONS

### Assessment

- Assess cardiac glycoside level if both products are being administered
- Assess for signs of vit A, D, K deficiency
- **Hypercholesterolemia:** monitor fasting LDL, HDL, total cholesterol, triglyceride levels baseline and q4wk after initiation of treatment and periodically, electrolytes if on extended therapy
- Monitor bowel pattern daily; increase bulk, $H_2O$ in diet for constipation
- **Diabetes:** Assess for hypoglycemia (weakness, hunger, dizziness, diaphoresis), can result from use of this product

### Patient/family education

- To take with meal and fluids
- Teach the importance of compliance; toxicity may result if doses missed, timing of dose 4 hr after other meds
- Teach that risk factors should be decreased: high-fat diet, smoking, alcohol consumption, absence of exercise
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected or if breastfeeding, insulin may be used in diabetes during pregnancy; to use another form of contraception other than oral contraceptives

### Evaluation

**Positive therapeutic outcome**

- Decreased cholesterol level (hyperlipidemia); diarrhea, pruritus (excess bile acids), collagenase *Clostridium histolyticum*

## conivaptan (Rx)

(kon-ih-vap'tan)

**Vaprisol**

*Func. class.:* Vasopressin receptor antagonist

**ACTION:** Dual arginine vasopressin (AVP) antagonist with affinity for $V_{1A}$, $V_2$ receptors; level of AVP in circulating blood is critical for regulation of water, electrolyte balance and is usually elevated in euvolemic/hypervolemic hyponatremia

**Therapeutic outcome:** Correct serum sodium levels

**USES:** Euvolemia hyponatremia in those hospitalized, not indicated for HF, hypervolemia, hyponatremia

## CONTRAINDICATIONS

Hypersensitivity, hypovolemia

**Precautions:** Pregnancy, breastfeeding, orthostatic/renal disease, heart failure, rapid correction of serum sodium

## DOSAGE AND ROUTES

**Adult: IV** INF loading dose 20 mg given over 30 min, then CONT **IV** over 24 hr; after 1 day, give for an additional 1-3 days as a CONT INF of 20 mg/day total, can be titrated up to 40 mg/day if serum sodium is not rising at the desired rate; max time 4 days

### Hepatic/renal dose

**Adult:** IV Child-Pugh A-C or CCr 30-60 ml/min: Give IV loading dose over 10 min, then cont IV INF 10 mg over 24 hr × 2-4 days

**Available forms:** Injection (premixed) 0.2 mg/ml in 100 ml $D_5W$

### Implementation

**Intermittent IV infusion**

- Withdraw 4 ml (20 mg) of conivaptan, add to 100 ml $D_5W$, gently invert several times to mix, give over 30 min; in large vein, change site q24hr to minimize vascular irritation

**Continuous IV infusion route**

- Withdraw 4 ml (20 mg) of conivaptan, add to 250 ml $D_5W$, gently invert several times to mix, give over 24 hr; or 40 mg in 250 ml $D_5W$, gently invert several times to mix, give over 24 hr

## ADVERSE EFFECTS

**CNS:** Headache, confusion, insomnia

**CV:** Atrial fibrillation, hypo/hypertension, orthostatic hypotension, phlebitis

**GI:** Nausea, vomiting, constipation, dry mouth

**GU:** Hematuria, polyuria, UTI, pollakiuria

**HEMA:** Anemia
**INTEG:** Erythema, inj site reaction
**META:** Dehydration, hypo/hyperglycemia, hypokalemia, hypomagnesia, hyponatremia
**MISC:** Oral candidiasis, pain, peripheral edema, pneumonia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 99% |
| **Metabolism** | By CYP3A4 |
| **Excretion** | Unknown |
| **Half-life** | Terminal 5 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Drug classifications

CYP3A4 substrates (alfuzosin, ARIPiprazole, bexarotene, bortezomib, bosentan, bupivacaine, buprenorphine, carBAMazepine, cevimeline, cilostazol, cinacalcet, clopidogrel, colchicine, cyclobenzaprine, dapsone, darifenacin, disopyramide, DOCEtaxel, donepezil, DOXOrubicin, dutasteride, eletriptan, eplerenone, ergots, erlotinib, eszopiclone, ethinyl estradiol, ethosuximide, etoposide, fentaNYL, galantamine, gefitinib, halofantrine, ifosfamide, irinotecan, levobupivacaine, levomethadyl, lidocaine, loperamide, loratadine, mefloquine, methadone, modafinil, PACLitaxel, pimozide, praziquantel, quiNIDine, quiNINE, ramelteon, reboxetine, repaglinide, rifabutin, sibutramine, sildenafil, sirolimus, SUFentanil, SUNItinib, tacrolimus, tamoxifen, teniposide, testosterone, tiaGABine, tinidazole, trimetrexate, vardenafil, vinca alkaloids, ziprasidone, zolpidem, zonisamide): increased effects, do not use concurrently

## NURSING CONSIDERATIONS

### Assessment

- Monitor renal/hepatic function
- Assess frequent sodium volume status; overly rapid correction of sodium concentration (>12 mEq/L per 24 hr) may result in osmotic demyelination syndrome
- Assess neurologic status: confusion, headache
- Assess CV status: atrial fibrillation, hyper/hypotension, orthostatic hypotension; monitor B/P, pulse
- Monitor other electrolytes (magnesium and potassium)
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, may cause fetal harm discontinue breastfeeding or product, excretion unknown

### Patient/family education

- Advise patient to report neurologic changes: headache, insomnia, confusion
- Teach patient administration procedure and expected result
- Advise patient to report inj site pain, redness, swelling

### Evaluation

**Positive therapeutic outcome**

- Correction of serum sodium levels

## CONTRACEPTIVES, HORMONAL

**MONOPHASIC, ORAL**

**ethinyl estradiol/desogestrel (Rx)**
**Apri, Apri-28, Desogen, Emoquette, Mircette, Ortho-Cept, Reclipsen, Solia, Velivet**

**ethinyl estradiol/drospirenone (Rx)**
**Beyaz, Gianvil Loryna, Nikki, Ocella, Yasmin, Safyral, Syeda, Vestura, Yaz 28, Yaela, Zarah**

**Biphasic, Kariva, Mircette, Viorelle, Triphasic Cyclessa, Velivel**

**ethinyl estradiol/ethynodiol (Rx)**
**Kelnor 1/35, Zovia 1/35, Zovia 1/50**

**ethinyl estradiol/levonorgestrel (Rx)**
**Aviane-28, Altavera, Aubra Chateal, Enpresse, Falmina, Kuruelo, Jolessa, Lessina, Levlen, Levora, Lutera, Marlissa, Nordette, Portia, Quasense, Seasonique, Sronyx, Vienva**

**ethinyl estradiol/norethindrone (Rx)**
**Alyacen 1/35, Brevicon, Briellin, Cyclafem 1/35, Dasetta 1/35, Femcon Fe, Femhrt, Generess Fe 0.5/35, Genora 1/35, Junel 21 1/20, Junel 21 1.5/20, Larin 1/20, Lorin 1.5/30, Larin Fe 1/20, Larin Fe 1.5/30, Loestrin 21 1.5/30, Loestrin 21 1/20, Microgestin, Modicon, Necon 0.5/35, N.E.E 1/35, Nelova 0.5/35E, Nelova 1/35E, Norcept-E 1/35, Norethin**

1/35E, Norinyl 1+35, Norlestrin 1/50, Norlestrin 2.5/50, Nortrel 1/35, Nortrel 7/7/7

**ethinyl estradiol/norgestimate (Rx)**

Estrayella, Mono-Linyah, MonoNessa, Ortho-Cyclen, Previfem, Sprintec

**ethinyl estradiol/norgestrel (Rx)**

Cryselle, Elinest, Lo/Ovral, Low-Ogestrel, Ogestrel

**mestranol/norethindrone (Rx)**

Genora 1/50, Nelova 1/50m, Norethin 1/50m, Necon 1/50, Norinyl 1+50, Ortho-Novum 1/50

BIPHASIC, ORAL

**ethinyl estradiol/norethindrone (Rx)**

Nelova 10/11, Ortho-Novum 10/11

TRIPHASIC, ORAL

**ethinyl estradiol/desogestrel (Rx)**

Azurette, Bekyree, Kariva, Kimidess, Pimtrea, Viorele

**ethinyl estradiol/norethindrone (Rx)**

Necor 7/7/7, Nortrel 7/7/7, Ortho-Novum 7/7/7, Tri-Norinyl

**ethinyl estradiol/norgestimate (Rx)**

Ortho Tri-Cyclen, Tri-E Starylla, Tri-Linyah, Ortho Tri-Cyclen Lo

**ethinyl estradiol/levonorgestrel (Rx)**

Enpresse, Levonest, Myzilra, Tri-Levlen, Triphasil

EXTENDED CYCLE, ORAL

**ethinyl estradiol/levonorgestrel (Rx)**

Seasonale

PROGESTIN, ORAL

**norethindrone (Rx)**

Errin, Jencycla, Ortho Micronor, Camila, Jolivette, Nor-Q D, Nora-BE

PROGRESSIVE ESTROGEN, ORAL

**ethinyl estradiol/norethindrone acetate (Rx)**

Estrostep, Estrostep Fe

EMERGENCY

**levonorgestrel (Rx)**

Plan B, Fallback Solo

**medroxyPROGESTERone (Rx)**

Depo-Provera, Depo-Subq Provera 104

INTRAUTERINE

**levonorgestrel (Rx)**

Mirena, Skyla

IMPLANT

**etonogestrel (Rx)**

Implanon, Nexplanon

VAGINAL RING

**ethinyl estradiol/etonogestrel (Rx)**

Nuva Ring

TRANSDERMAL

**ethinyl estradiol/norelgestromin (Rx)**

Yulane

**ACTION:** Prevents ovulation by contraceptives suppressing FSH, LH; *monophasic:* estrogen/progestin (fixed dose) used during a 21-day cycle; ovulation is inhibited by suppression of FSH and LH; thickness of cervical mucus and endometrial lining prevents pregnancy; *biphasic:* ovulation is inhibited by suppression of FSH and LH; alteration of cervical mucus, endometrial lining prevents pregnancy; *triphasic:* ovulation is inhibited by suppression of FSH and LH; change of cervical mucus, endometrial lining prevents pregnancy; variable doses of estrogen/progestin combinations may be similar to natural hormonal fluctuations; *extended cycle:* estrogen/progestin continuous for 84 days, off for 7 days, result 4 menstrual periods/yr; *progressive estrogen:* constant progestin with 3 progressive doses of estrogen; *progestin-only pill, implant, intrauterine:* change of cervical mucus and endometrial lining prevents pregnancy; ovulation may be suppressed

**Therapeutic outcome:** Prevention of pregnancy, decreased severity of endometriosis, hypermenorrhea

**USES:** To prevent pregnancy, regulation of menstrual cycle, treatment of acne in women >14 yr that other treatment has failed, emergency contraception; *injection:* inhibits gonadotropin secretion, ovulation, follicular maturation; *emergency:* inhibits ovulation and fertilization, decreases transport of sperm and egg from fallopian tube to uterus; *vaginal ring, transdermal:* inhibits ovulation, prevents sperm entry into uterus; *antiacne:* may decrease sex hormone binding globulin, results in decreased testosterone

## CONTRAINDICATIONS

Pregnancy, breastfeeding, women 40 yr and over, reproductive cancer, thrombophlebitis, MI, hepatic tumors, hepatic disease, CAD, CVA, breast cancer, jaundice, stroke, vaginal bleeding

**Precautions:** Depression, hypertension, renal disease, seizure disorders, lupus erythematosus, rheumatic disease, migraine headache, amenorrhea, irregular menses, gallbladder disease, diabetes mellitus, heavy smoking, acute mononucleosis, sickle cell disease

**BLACK BOX WARNING:** Tobacco smoking

## DOSAGE AND ROUTES

### Monophasic

**Adult:** PO take first tab on Sunday after start of menses × 21 days; skip 7 days; then repeat cycle; start on 1st day of menses × 21 days; skip 7 days, then repeat cycle; may contain 7 placebo tabs, where 1 tab is taken daily

### Biphasic

**Adult:** PO Take 10 days of small progestin, then large progestin; estrogen is the same during cycle; skip 7 days, then repeat cycle; may contain 7 placebo tabs, where 1 tab is taken daily

### Triphasic

**Adult:** PO estrogen dose remains constant, progestin changes throughout 21 day cycle, some products contain 28 tabs per month

### Extended cycle

**Adult:** PO start taking on first day of menses; continue for 84 days of active tab, then 7 days of placebo; repeat cycle

### Progestin

**Adult:** PO start on 1st day of menses, then daily and continuously

### Progressive estrogen

**Adult:** PO progestin dose remains constant, estrogen increases q7days throughout 21-day cycle, may include 7 placebo tabs for 28-day cycle

### Emergency

**Adult and adolescent:** Give within 72 hr of intercourse, repeat 12 hr later; Plan B 1 tab, then 1 tab 12 hr later; Preven 2 tab, then 2 tab 12 hr later; Ovral 2 white tabs; Lo/Ovral 4 white tabs; Levlen, Nordette 4 orange tabs; Triphasil, Tri-Levlen 4 yellow tabs; ulipristal 1 tab as soon as possible within 120 hr

### Injectable

**Adult:** IM (Depo-Provera) 150 mg within 5 days of start of menses, or within 5 days postpartum (must not be breastfeeding); if breastfeeding, give 6 wk postpartum, repeat q3mo

### Intrauterine

**Adult:** To be inserted using the levonorgestrel-releasing intrauterine system (LRIS) by those trained in procedure; inserted into uterine cavity within 7 days of the onset of menstruation; use should not exceed 5 years per implant

### Vaginal ring

**Adult:** VAG insert 1 ring on or prior to day 5 of cycle, leave in place 3 wk; remove for 1 wk, then repeat

### Transdermal

**Adult:** Transdermal apply patch within 7 days of menses, change weekly × 3 wk; no patch wk 4, repeat cycle

### Implant

**Adult:** Subdermal in inner side of upper arm on days 1-5 of menses, replace q3yr

### Acne

**Adult:** PO (Ortho Tri-Cyclen) take daily × 21 days, off 7 days

### Implementation

**PO route**

- If GI symptoms occur, medication may be taken with food; take at same time each day

**Implant route**

- Inject 6 cap subdermally
- Implant is effective for 5 yr, should be removed after that

**IM route**

- Administer inj deep in large muscle mass after shaking susp well; ensure pregnancy has not occurred if inj are 2 wk or more apart

## ADVERSE EFFECTS

**CNS:** Depression, fatigue, dizziness, nervousness, anxiety, headache

**CV:** Increased B/P, cerebral hemorrhage, thrombosis, pulmonary embolism, fluid retention, edema, MI

**EENT:** Optic neuritis, retinal thrombosis, cataracts

**ENDO:** Decreased glucose tolerance, increased TBG, PBI, $T_4$, $T_3$, temporary infertility

**GI:** *Nausea,* vomiting, cramps, diarrhea, bloating, constipation, change in appetite, cholestatic jaundice, weight change
**GU:** Breakthrough bleeding, amenorrhea, spotting, dysmenorrhea, galactorrhea, endocervical hyperplasia, vaginitis, cystitis-like syndrome, breast change
**HEMA:** Increased fibrinogen, clotting factor
**INTEG:** *Chloasma, melasma,* acne, rash, urticaria, erythema, pruritus, hirsutism, alopecia, photosensitivity

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Breast milk |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Griseofulvin, rifAMPin: decreased effectiveness of oral contraceptive

### Drug classifications

Analgesics, antibiotics, anticonvulsants, antihistamines: decreased action of oral contraceptives
Anticoagulants (oral): decreased action of oral anticoagulants

### Drug/herb

Black cohosh: altered action
Saw palmetto, St. John's wort: decreased oral contraceptive effect

### Drug/food

Grapefruit juice: increased peak level

### Drug/lab test

Increased: pro-time; clotting factors VII, VIII, IX, X; TBG, PBI, $T_4$, platelet aggregation, BSP, triglycerides, bilirubin, AST, ALT
Decreased: $T_3$, antithrombin III, folate, metyraPONE test, GTT, 17-OHCS

## NURSING CONSIDERATIONS

### Assessment

- Assess for reproductive changes: change in breasts, tumors, positive Pap smear; product should be discontinued if changes occur
- Monitor glucose, thyroid function, liver function tests, B/P
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

- Teach patient about detection of clots using Homans' sign; teach monitoring technique for heat, redness, pain, swelling
- Teach patient to use sunscreen or to avoid sunlight; photosensitivity can occur
- Teach patient to take at same time each day to ensure equal product level; to take another tab as soon as possible if one is missed
- Teach patient that after product is discontinued, pregnancy may not occur for several mo
- Instruct patient to report GI symptoms that occur after 4 mo
- Advise patient to use another birth control method during first 3 wk of oral contraceptive use
- Teach patient to report abdominal pain, change in vision, shortness of breath, change in menstrual flow, spotting, breakthrough bleeding, breast lumps, swelling, headache, severe leg pain, mental changes; that continuing medical care is needed: Pap smear and gynecologic exam q6mo

**BLACK BOX WARNING:** Teach patient not to smoke, increased risk of CV side effects

- Teach patient to notify physicians and dentist of oral contraceptive use

### Evaluation

**Positive therapeutic outcome**

- Absence of pregnancy
- Decreased severity of endometriosis
- Decreased severity of hypermenorrhea

## cotrimoxazole

*See trimethoprim/sulfamethoxazole*

**⚠ HIGH ALERT**

## crizotinib

(kriz-oh'ti-nib)
**XALKORI**
*Func. class.:* Antineoplastic; biologic response modifiers

**ACTION:** An inhibitor of receptor tyrosine kinases (anaplastic lymphoma kinase (ALK), hepatocyte growth factor receptor (HGFR, c-Met), recepteur d'origine nantais (RON).

**Therapeutic outcome:** Decreased spread of malignancy

**USES:** Locally advanced or metastatic non–small-cell lung cancer (NSCLC) that is anaplastic lymphoma kinase (ALK)-positive as detected by an FDA-approved test

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity

**Precautions:** Pneumonitis, severe hepatic disease, congenital long QT syndrome, neonates, infants, children, adolescents, severe renal impairment, end-stage renal disease, vision disorders

## DOSAGE AND ROUTES

**Adult: PO** 250 mg bid; continue as long as is beneficial

### Dose adjustments for hematologic toxicities

For Grade 1-2: No dosage adjustment needed

For Grade 3: Interrupt treatment until toxicity resolves to grade ≤2, then, continue with the same dosage schedule. In case of recurrence after a grade 4 event with dose reduction, interrupt treatment until toxicity resolves to grade ≤2; when resuming treatment, reduce dosage to 250 mg PO daily

For Grade 4: Interrupt treatment until toxicity resolves to grade ≤2; when resuming treatment, reduce dosage to 200 mg PO bid. In case of grade 4 recurrence, permanently discontinue treatment

### Dose adjustment for hepatic laboratory abnormalities

For Grade 1: No dosage adjustment necessary:

For Grade 2 ALT/AST elevations with grade ≤1 total bilirubin elevations: No dosage adjustment necessary

For Grade 3-4 ALT/AST elevations with grade ≤1 total bilirubin elevations: Interrupt treatment until toxicity resolves to grade ≤1 or baseline; when resuming treatment, reduce dosage to 200 mg PO bid; in case of recurrence, interrupt treatment until toxicity resolves to grade ≤1, and when resuming treatment, reduce dosage to 250 mg PO daily; permanently discontinue treatment in case of further recurrence

For Grade 2-4 ALT/AST elevations with concurrent Grade 2-4 total bilirubin elevations (in the absence of cholestasis or hemolysis): Permanently discontinue treatment

### Dose adjustment for pneumonitis not attributable to NSCLC progression, other pulmonary disease, infection, or radiation effect

For any grade pneumonitis: Permanently discontinue

### Dose adjustment for QTc prolongation

For Grade 1–2 QTc prolongation: No dosage adjustment necessary

For Grade 3 QTc prolongation: Interrupt treatment until toxicity resolves to grade ≤1; when resuming treatment, reduce dosage to 200 mg PO bid; in case of recurrence, interrupt treatment until toxicity resolves to grade ≤1 and when resuming treatment, reduce dosage to 250 mg PO daily; permanently discontinue in case of further recurrence

For Grade 4 QTc prolongation: Permanently discontinue

**Available forms:** Caps 200, 250 mg

### Implementation

- May be taken orally with or without food
- Have the patient swallow capsule whole; do not crush or chew
- If a dose is missed, it can be taken up to 6 hr before the next dose is due to maintain the twice daily regimen. Do not take both doses at the same time
- Store capsules at room temperature

## ADVERSE EFFECTS

**CNS:** Dizziness, balance disorder, presyncope, neuropathy (motor and sensory), burning sensation, dysesthesia, hyperesthesia, hypoesthesia, neuralgia, paresthesias, peripheral neuropathy (motor and sensory), headache, insomnia

**CV:** QT prolongation, disseminated intravascular coagulation (DIC), septic shock, bradycardia

**EENT:** *Diplopia, photopsia,* photophobia, *blurred vision,* visual field defect, *vitreous floaters,* visual brightness, *reduced visual acuity,* esophageal disorders, dyspepsia

**GI:** *Nausea, diarrhea, vomiting, constipation,* decreased appetite, dysgeusia, abdominal pain, abdominal discomfort/pain, stomatitis, oral ulceration, elevated hepatic enzymes, hyperbilirubinemia, glossodynia, glossitis, cheilitis, mucosal inflammation, oropharyngeal pain/discomfort, oral pain, esophageal disorder, dysphagia, epigastric discomfort/pain, burning, esophagitis, esophageal obstruction/pain/spasm, esophageal ulceration, gastroesophageal reflux, odynophagia, and reflux esophagitis

**HEMA:** Grade 3/4 neutropenia, thrombocytopenia, lymphopenia

**MISC:** Fatigue, fever, *edema,* localized/peripheral edema, chest pain (unspecified), chest discomfort, musculoskeletal chest pain, arthralgia, back pain, rash

**RESP:** Severe, life-threatening pneumonitis, pneumonia, hypoxia, acute respiratory distress syndrome (ARDS), dyspnea, empyema, pulmonary hemorrhage, pulmonary embolism, upper respiratory tract infection (nasopharyngitis, pharyngitis, rhinitis), cough

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 43% |
| **Distribution** | Steady state 15 days, protein binding 91%, distribution tissue, plasma |
| **Metabolism** | By 3YPA4/5, oxidation to metabolites |
| **Excretion** | 63% feces, unchanged 53%; 22% urine, unchanged 2, 3% |
| **Half-life** | Terminal 42 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 4-6 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

CYP2B6 substrates (prasugrel, selegiline, cyclophosphamide): increased action of these products

β-agonists, Class IA antiarrhythmics (disopyramide, procainamide, quiNIDine), Class III antiarrhythmics (amiodarone, dofetilide, ibutilide, sotalol), halogenated anesthetics, local anesthetics, tricyclic antidepressants: increased QT prolongation, torsades de pointes

CYP3A4 inhibitors (ketoconazole, atazanavir, indinavir, itraconazole, nefazodone, nelfinavir, ritonavir, voriconazole, boceprevir, delavirdine, isoniazid, dalfopristin-quinupristin, tipranavir): increased crizotinib

CYP3A4 inducers (rifAMPin, carBAMazepine, PHENobarbital, phenytoin, rifabutin); antacids, H2-blockers, proton pump inhibitors (PPIs): decreased crizotinib

CYP3A4 substrates (alfentanil, cycloSPORINE, ergotamine, dihydroergotamine fentaNYL, sirolimus, colchicine): avoid concurrent use

### Individual drugs

Abarelix, alfuzosin, amoxapine, apomorphine, arsenic trioxide, asenapine, chloroquine, ciprofloxacin, citalopram, clarithromycin, cloZAPine, cyclobenzaprine, dasatinib, dolasetron, dronedarone, droperidol, eriBULin, erythromycin, ezogabine, flecainide, fluconazole, gatifloxacin, gemifloxacin, grepafloxacin, halofantrine, haloperidol, iloperidone, indacaterol, lapatinib, levofloxacin, levomethadyl, lopinavir/ritonavir, magnesium sulfate, maprotiline, mefloquine, methadone, moxifloxacin, nilotinib, norfloxacin, octreotide, ofloxacin, OLANZapine, ondansetron, paliperidone, palonosetron, pentamidine, certain phenothiazines (chlorproMAZINE, mesoridazine, thioridazine, fluPHENAZine, perphenazine, prochlorperazine, trifluoperazine), pimozide, posaconazole, potassium sulfate, probucol, propafenone, QUEtiapine, quiNIDine, ranolazine, rilpivirine, risperiDONE, saquinavir, sodium, sparfloxacin, SUNItinib, tacrolimus, telavancin, **telithromycin**, tetrabenazine, troleandomycin, vardenafil, **vemurafenib**, venlafaxine, vorinostat, ziprasidone: increased QT prolongation, torsades de pointes

Midazolam: increased midazolam action

### Drug/herb

Do not use with St. John's wort

### Drug/food

Do not use with grapefruit juice

## NURSING CONSIDERATIONS

### Assessment

- **Severe, life-threatening, or fatal treatment-related pneumonitis:** All cases occurred within 2 months of treatment initiation; monitor for pulmonary symptoms that may indicate pneumonitis and other causes of pneumonitis should be excluded; permanently discontinue in patients with treatment-related pneumonitis
- **Hepatic disease:** Liver function test (LFT) abnormalities, altered bilirubin levels, may occur during treatment; monitor LFTs and bilirubin levels prior to treatment, then monthly; more frequent testing is needed in those presenting with grade 2 or greater toxicities; Laboratory alterations should be managed with dose reduction, treatment interruption, or discontinuation
- **QT prolongation:** has been reported with the use of crizotinib; crizotinib should be avoided in these patients. Monitor ECG and electrolytes in those with HF, bradycardia, electrolyte imbalance (hypokalemia, hypomagnesemia), or in those who are taking concomitant medications known to prolong the QT interval; treatment interruption, dosage adjustment, or treatment discontinuation may be needed in those who develop QT prolongation
- **Vision disorders:** Generally started within 2 weeks of the start of therapy; ophthalmologic evaluation should be considered, particularly if patients experience photopsia or new/ increased vitreous floaters; caution should be used when driving or operating machinery by patients who experience vision disorders
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, do not use in pregnancy, avoid breastfeeding
- CBC with differential; BUN/creatinine

### Patient/family education
- Missed doses can be taken up to 6 hr before the next dose is due to maintain the twice daily regimen
- Teach patient to use reliable contraception; both women and men of childbearing age should use adequate contraceptive methods during therapy and for at least 90 days after completing treatment; pregnancy
- Teach patient to report immediately shortness of breath, cough, fatigue, visual changes
- Teach patient not to take with grapefruit juice
- Teach patient to avoid activities requiring mental alertness until effects are known
- Teach patient to report signs of QT prolongation (abnormal heartbeats, dizziness, syncope)
- Teach patient to swallow caps whole and avoid contact with broken cap

### Evaluation
**Positive therapeutic outcome**
- Decreased spread of malignancy

## crofelemer
(kroe-fel′e-mer)
**Mytesi**
*Func. class.:* Antidiarrheal
*Chem. class.:* Red sap of *Croton lechleri* plant

**ACTION:** Blocks chloride channel and high volume water loss in diarrhea

**Therapeutic outcome:** Decreasing diarrhea

**USES:** Noninfectious diarrhea in those with HIV/AIDS using antiretrovirals

## CONTRAINDICATIONS
Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, Black patients, children/ adolescents, GI disease, infection, malabsorption syndrome, pancreatitis

## DOSAGE AND ROUTES
**Adult: PO** 125 mg bid

**Available forms:** Del rel tabs 125 mg

### Implementation
**PO route**
- Do not break, crush, or chew
- Give without regard to meals

## ADVERSE EFFECTS
**CNS:** Dizziness, depression
**GI:** Nausea, constipation, abdominal pain, anorexia, flatulence, hyperbilirubinemia
**INTEG:** Acne vulgaris, contact dermatitis
**MISC:** Arthralgia, cough, increased urinary frequency

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS
### Individual drugs
Alosetron: increased serious constipation, bowel obstruction

### Drug classifications
Antimuscarinics, opiate agonists: increased constipation

## NURSING CONSIDERATIONS
### Assessment
- Stools: volume, color, characteristic frequency; bowel pattern before protein rebound constipation
- Electrolytes (K, Na, Cl), hydration status
- Monitor effect in Black patients; may be less effective
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk

### Patient/family education
- Instruct patient to avoid OTC products unless directed by prescriber
- Instruct patient not to operate machinery if drowsiness occurs

### Evaluation
**Positive therapeutic outcome:**
- Decreased diarrhea

## cyclobenzaprine (Rx)
(sye-kloe-ben′za-preen)
**Amrix**
*Func. class.:* Skeletal muscle relaxant, central acting
*Chem. class.:* Tricyclic amine salt

**Do not confuse:** cyclobenzaprine/ cyproheptadine

**ACTION:** Reduction of tonic muscle activity at the brain stem; may be related to antidepressant effects

**Therapeutic outcome:** Relaxation of skeletal muscle

## USES:
Adjunct for relief of muscle spasm and pain in musculoskeletal conditions

**Unlabeled uses:** Fibromyalgia

## CONTRAINDICATIONS
Acute recovery phase of MI, dysrhythmias, heart block, HF, hypersensitivity, child <12 yr, intermittent porphyria, thyroid disease

**Precautions:** Pregnancy, breastfeeding, geriatric, renal/hepatic disease, addictive personality

## DOSAGE AND ROUTES
### Musculoskeletal disorders
**Adult/adolescent ≥15 yr:** PO 5 mg tid × 1 wk, max 30 mg/day × 3 wk
**Adult:** EXT REL 15 mg q day, max 30 mg q day × 3 wk
**Geriatric:** PO 5 mg tid

### Hepatic dose
**Adult (mild hepatic disease):** PO 5 mg, titrate slowly

### Fibromyalgia (unlabeled)
**Adult:** PO 10 mg at bedtime, titrated up

**Available forms:** Tabs 5, 7.5, 10 mg; ext rel tab 15, 30 mg

### Implementation
- Give without regard to meals, give with food for GI symptoms
- Store in airtight container at room temperature

## ADVERSE EFFECTS
**CNS:** *Dizziness, weakness, drowsiness,* headache, tremor, depression, insomnia, confusion, paresthesia, nervousness
**CV:** Postural hypotension, tachycardia, dysrhythmias
**EENT:** Diplopia, temporary loss of vision, blurred vision
**GI:** *Nausea,* vomiting, hiccups, dry mouth, constipation, hepatitis
**GU:** Urinary retention, frequency, change in libido
**INTEG:** Rash, pruritus, fever, facial flushing, sweating

### Pharmacokinetics

| | |
|---|---|
| **Distribution** | Well |
| **Metabolism** | Liver, partially |
| **Excretion** | Kidney (unchanged) |
| **Half-life** | 1-3 days, 32 hr ext rel |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 1 hr |
| **Peak** | 3-8 hr |
| **Duration** | 12-24 hr |

## INTERACTIONS
### Individual drugs
Alcohol: increased CNS depression
TraMADol: do not use within 14 days

### Drug classifications
Antidepressants (tricyclic), barbiturates, opiates, sedative/hypnotics: increased CNS depression
**MAOIs:** do not use within 14 days
**Serotonin syndrome—SSRIs, SNRIs, tricyclics, triptans, fentaNYL, busPIRone, traMADol:** increased action of these products

### Drug/herb
Kava, chamomile, hops, valerian: increased CNS depression

## NURSING CONSIDERATIONS
### Assessment
- **Serotonin syndrome:** if using with SSRIs, SNRIs, monitor closely; if syndrome occurs, discontinue both products immediately
- Assess pain periodically: location, duration, mobility, stiffness, baseline
- Monitor ECG in epileptic patients; poor seizure control has occurred in patients taking this product
- Check for allergic reactions: rash, fever, respiratory distress
- Check for severe weakness, numbness, in extremities
- Assess for CNS depression: dizziness, drowsiness, psychiatric symptoms
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if clearly needed, use cautiously in breastfeeding
- **Beers:** Avoid use in older adults, anticholinergic effects

### Patient/family education
- Teach patient not to discontinue medication quickly; insomnia, nausea, headache, spasticity, tachycardia will occur; product should be tapered off over 1-2 wk
- Caution patient not to take with alcohol, other CNS depressants
- Advise to avoid altering activities while taking this product
- Caution patient to avoid hazardous activities if drowsiness/dizziness occurs
- Caution patient to avoid using OTC medication: cough preparations, antihistamines, unless directed by prescriber

• Teach patient to use gum, frequent sips of water for dry mouth
• Teach patient to notify prescriber of serotonin syndrome

### Evaluation

**Positive therapeutic outcome**

• Decreased pain, spasticity; muscle spasms of acute, painful musculoskeletal conditions are generally short term; long-term therapy is seldom warranted

## TREATMENT OF OVERDOSE:

Empty stomach with emesis, gastric lavage, then use anticonvulsants if indicated; monitor cardiac function

## cyclopentolate ophthalmic

*See Appendix B*

**⚠ HIGH ALERT**

## cyclophosphamide (Rx)

(sye-kloe-foss′fa-mide)
**Cytoxan, Procytox** 🍁
*Func. class.:* Antineoplastic alkylating agent
*Chem. class.:* Nitrogen mustard

**Do not confuse:** cyclophosphamide/cycloSPORINE

**ACTION:** Alkylates DNA; responsible for cross-linking DNA strands; activity is not cell cycle phase specific

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** Hodgkin's disease, lymphomas, leukemia, multiple myeloma, neuroblastoma, retinoblastoma, Ewing's sarcoma, cancer of female reproductive tract, breast, nephrotic syndrome

## CONTRAINDICATIONS

Pregnancy, hypersensitivity, prostatic hypertrophy, bladder neck obstruction

**Precautions:** Radiation therapy, cardiac disease, anemia, dysrhythmias, child, dental disease/work, dialysis, geriatrics, heart failure, hematuria, infections, leukopenia QT prolongation, secondary malignancy surgery, tumor lysis syndrome, vaccinations, breastfeeding, severely depressed bone marrow function

## DOSAGE AND ROUTES

### Acute lymphocytic leukemia (ALL) (induction therapy)

**Adult/adolescent/child:** IV 300-1500 mg/m² have been used with induction, intensification, and consolidation regimens that may include prediSONE, vinCRIStine and others; PO 1-5 mg/kg/day adjusted to response

### Neuroblastoma

**Adult/child:** **IV** For induction, 40-50 mg/kg in divided doses over 2-5 days or 10-15 mg/kg q7-10 days, 3-5 mg/kg 2 times/wk or 1-5 mg/kg daily
**Child and infant:** PO 150 mg/m²/day, days 1-7 with DOXOrubicin (**IV** 35 mg/m² on day 5) q21days × 5 cycles
**Child:** **IV** 70 mg/kg/day with hydration on days 1 and 2 with DOXOrubicin and vinCRIStine q21days for courses 1, 2, 4, 6, alternating with CISplatin and etoposide q21days for courses 3, 5, 7

### Breast cancer

**Adult:** PO 100-200 mg/m²/day or 2 mg/kg/day × 4-14 days; **IV** 500-1000 mg/m² on day 1 in combination with fluorouracil and methotrexate or DOXOrubicin, or DOXOrubicin alone; also cyclophosphamide 600 mg/m², may be given dose-dense on day 1 of q14day with DOXOrubicin (60 mg/m²) with growth factor support

### Operable node-positive breast cancer

**IV (TAC regimen) Adult:** 500 mg/m² with DOXOrubicin (50 mg/m² **IV**) then DOCEtaxel (75 mg/m²) **IV** given 1 hr later × 6 cycles q3wk

### Nephrotic syndrome

**Child:** PO 2.5-3 mg/kg q day × 60-90 days

**Available forms:** Inj **IV** 200 🍁, 500 mg, 1, 2 g; vials 25, 50 mg

### Implementation

• Give fluids **IV** or PO before chemotherapy to hydrate patient
• Give antacid before oral agent, after PM meals, before bedtime; antiemetic 30-60 min before giving product to prevent vomiting and prn; antibiotics for prophylaxis of infection
• Give top or syst analgesics for pain; give in AM so product can be eliminated before bedtime
• Use cytotoxic handling procedures

**PO route**

• To be taken on empty stomach; do not crush, break, chew tab, wash hands immediately if in contact with tab
• May be taken as a single dose or divided doses
• Take in AM or afternoon, avoid evening

**Direct IV**

• Reconstitute with NS only
• Store in tight container at room temperature

**Intermittent IV infusion route**
- Use cytotoxic handling procedures
- Give **IV** after diluting 100 mg/5 ml of sterile or bacteriostatic water; shake; let stand until clear; may be further diluted in up to 250 ml $D_5$ 0.9% NaCl, 0.45% NaCl, give 100 mg or less/min through 3-way stopcock of glucose or saline inf
- Use 21-, 23-, or 25-G needle; check site for irritation, phlebitis

**Y-site compatibilities:** Amifostine, amikacin, ampicillin, azlocillin, aztreonam, bleomycin, cefamandole, ceFAZolin, cefepime, cefoperazone, cefotaxime, cefOXitin, cefuroxime, cephalothin, cephapirin, chloramphenicol, chlorproMAZINE, cimetidine, CISplatin, cladribine, clindamycin, dexamethasone, diphenhydrAMINE, DOXOrubicin, doxycycline, droperidol, erythromycin, famotidine, filgrastim, fludarabine, fluorouracil, furosemide, gallium, ganciclovir, gentamicin, granisetron, heparin, HYDROmorphone, IDArubicin, kanamycin, leucovorin, LORazepam, melphalan, methotrexate, methylPREDNISolone, metoclopramide, metroNIDAZOLE, mezlocillin, minocycline, mitoMYcin, moxalactam, nafcillin, ondansetron, oxacillin, PACLitaxel, penicillin G potassium, piperacillin, piperacillin/tazobactam, prochlorperazine, promethazine, propofol, raNITIdine, sargramostim, sodium bicarbonate, teniposide, tetracycline, thiotepa, ticarcillin, ticarcillin-clavulanate, tobramycin, trimethoprim-sulfamethoxazole, vancomycin, vinBLAStine, vinCRIStine, vinorelbine

**Solution compatibilities:** Amino acids 4.25%/$D_{25}$, $D_5$/0.9% NaCl, $D_5$W, 0.9% NaCl

## ADVERSE EFFECTS

**CNS:** Headache, dizziness
**CV:** Cardiotoxicity (high doses), myocardial fibrosis, congestive heart failure, pericarditis
**ENDO:** Syndrome of inappropriate antidiuretic hormone (SIADH), gonadal suppression
**GI:** *Nausea, vomiting, diarrhea, weight loss,* colitis, hepatotoxicity
**GU:** Hemorrhagic cystitis, hematuria, neoplasms, amenorrhea, azoospermia, sterility, ovarian fibrosis, renal tubular fibrosis
**HEMA:** Thrombocytopenia, leukopenia, pancytopenia, myelosuppression
**INTEG:** *Alopecia,* dermatitis
**META:** Hyperuricemia
**MISC:** Secondary neoplasms, anaphylaxis
**RESP:** Pulmonary fibrosis, interstitial pneumonia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO) |
| **Distribution** | Widely distributed; crosses placenta, blood-brain barrier (50%) |
| **Metabolism** | Liver to active product |
| **Excretion** | Kidneys, unchanged (30%) |
| **Half-life** | 4-6½ hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Allopurinol: increased bone marrow suppression
Chloramphenicol: decreased cyclophosphamide effect
Digoxin: decreased digoxin levels
Insulin: increased hypoglycemia
Succinylcholine: increased neuromuscular blockade
Warfarin: increased warfarin action

### Drug classifications

Diuretics (thiazides): increased bone marrow suppression
Barbiturates: increased toxicity of cyclophosphamide
Corticosteroids: decreased cyclophosphamide effect
Live virus vaccines: decreased antibody reaction

### Drug/herb

St. John's wort: increased toxicity

### Drug/lab test

Increased: uric acid
Decreased: pseudocholinesterase
False positive: Pap smear
False negative: PPD, mumps trichophytin, *Candida, Trichophyton,* Pap smear

## NURSING CONSIDERATIONS

### Assessment

- **Assess symptoms indicating severe allergic reaction:** rash, pruritus, urticaria, purpuric skin lesions, itching, flushing
- Assess for tachypnea, ECG changes, dyspnea, edema, fatigue
- **Bone marrow suppression:** Monitor CBC, increase fluid intake to 3 liters/day (adults) differential, platelet count weekly; withhold product if WBC count is $<2500/mm^3$ or platelet count is $<75{,}000/mm^3$; notify prescriber of results

- **Assess for hemorrhagic cystitis:** renal function studies including BUN, creatinine, serum uric acid, urine CCr before, during therapy; I&O ratio; report fall in urine output to <30 ml/hr, monitor
- Monitor temp q4hr (elevated temp may indicate beginning of infection)
- **Hepatotoxicity:** Monitor liver function tests before, during therapy (bilirubin, AST, ALT, LDH) as needed or monthly; note jaundice of skin or sclera, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea
- **Beers:** Avoid in older adults, delirium, dementia may occur; avoid in men due to decreased urine flow, retention
- **Assess for bleeding:** hematuria, stool guaiac, bruising or petechiae, mucosa or orifices q8hr
- Pulmonary fibrosis/interstitial pneumonia: Identify dyspnea, crackles, unproductive cough, chest pain, tachypnea
- Identify effects of alopecia on body image; discuss feelings about body changes

### Patient/family education

- Teach patient to avoid use of products containing aspirin or ibuprofen, razors, commercial mouthwash, since bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools, bruising)
- Instruct patient to report signs of anemia (fatigue, headache, irritability, faintness, shortness of breath)
- Teach patient to report any changes in breathing or coughing even several months after treatment
- Advise patient that hair may be lost during treatment; a wig or hairpiece may make patient feel better; new hair may be different in color, texture, skin, fingernails may become darker
- Advise patient on proper handling and disposal of chemotherapy drugs
- Teach patient not to have any vaccinations without the advice of the prescriber; serious reactions can occur
- **Pregnancy/breastfeeding:** Advise patient contraception is needed during treatment and for several months (men use condoms); 1 yr (women) after the completion of therapy
- Teach patient to take adequate fluids to eliminate product

### Evaluation

**Positive therapeutic outcome**

- Prevention of rapid division of malignant cells
- Increased appetite, increased weight

## cycloSPORINE (Rx)

(sye-kloe-spor'een)

**SandIMMUNE**

## cycloSPORINE, modified

**Gengraf, Neoral**

*Func. class.:* Immunosuppressant (antirheumatic, DMARD)

*Chem. class.:* Fungus-derived peptide

**Do not confuse:** cycloSPORINE/CycloSERINE/cyclophosphamide, SandIMMUNE/SandoSTATIN

**ACTION:** Produces immunosuppression by inhibiting T lymphocytes

**Therapeutic outcome:** Absence of transplant rejection

**USES:** Organ transplants (liver, kidney, heart, GVHD) to prevent rejection, rheumatoid arthritis, psoriasis

**Unlabeled uses:** Recalcitrant ulcerative colitis, aplastic anemia, Crohn's disease, thrombocytopenia purpura, lupus, nephritis, myasthenia gravis, psoriatic arthritis

## CONTRAINDICATIONS

Hypersensitivity to polyoxyethylated castor oil (inj only), psoriasis or rheumatoid arthritis in renal disease (Neoral/Gengraf), Gengraf/Neoral used with PUVA/UVB; methotrexate, coal tar, breastfeeding, ocular infections

**BLACK BOX WARNING:** Neoplastic disease, sunlight (UV) exposure, renal disease/failure, uncontrolled, malignant hypertension; radiation in psoriasis

**Precautions:** Pregnancy, geriatric, severe renal/hepatic disease

**BLACK BOX WARNING:** Immunosuppression, requires a specialized care setting and experienced clinician, nephrotoxicity, skin cancer

## DOSAGE AND ROUTES/NTI

### Prevention of transplant rejection (unmodified)

**Adult and child:** PO 15 mg/kg 4-12 hr before surgery, daily for 2 wk, reduce dosage by 2.5 mg/kg/wk to 5-10 mg/kg/day; **IV** 5-6 mg/kg 4-12 hr before surgery, daily, switch to PO form as soon as possible

### Prevention of transplant rejection (modified)

**Adult and child:** PO 4-12 mg/kg/day divided q12hr, depends on organ transplanted

### Rheumatoid arthritis (Neoral/Gengraf)
**Adult:** PO 2.5 mg/kg/day divided bid, may increase 0.5-0.75 mg/kg/day after 8-12 wk, max 4 mg/kg/day

### Psoriasis (Neoral/Gengraf)
**Adult:** PO 2.5 mg/kg/day divided bid × 4 wk, then increase by 0.5 mg/kg/day q2wk, max 4 mg/kg/day

### Idiopathic thrombocytopenia purpura (unlabeled)
**Adult:** PO 1.25-2.5 mg/kg bid

### Severe aplastic anemia (unlabeled)
**Adult and child:** PO 12 mg/kg/day or 15 mg/kg/day (child) with antithymocyte globulin (ATG)

**Available forms:** Oral sol (Neoral) 100 mg/ml; soft gel cap 25, 50, 100 mg; inj 50 mg/ml

### Implementation
**PO route**
- Some brands are not interchangeable
- Do not break, crush, or chew caps
- Use pipette provided to draw up oral sol; may mix with milk or juice, wipe pipette, do not wash (Neoral)
- Give for several days before transplant surgery with corticosteroids
- Microemulsion products (Neoral) and other products are not interchangeable
- Give with meals for GI upset or place product in chocolate milk (SandIMMUNE)

**Intermittent IV infusion route**
- Give **IV** after diluting each 50 mg/20-100 ml of 0.9% NaCl or $D_5W$; run over 2-6 hr; use an inf pump, glass inf bottles only

**Continuous IV infusion route**
- May run over 24 hr
- **For SandIMMUNE parenteral:** give 1/3 of PO dose, initial dose 4-12 hr prior to transplantation as a single **IV** dose 5-6 mg/kg/day, continue the single daily dose until PO can be used

**Y-site compatibilities:** Abciximab, alatrofloxacin, alfentanil, amikacin, aminocaproic acid, aminophylline, amphotericin B lipid complex, anidulafungin, argatroban, ascorbic acid injection, atenolol, atracurium, atropine, azaTHIOprine, aztreonam, benztropine, bivalirudin, bleomycin, bretylium, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, carmustine, caspofungin, ceFAZolin, cefmetazole, cefonicid, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, CISplatin, clindamycin, codeine, cyanocobalamin, cyclophosphamide, cytarabine, DACTINomycin, DAPTOmycin, DAUNOrubicin, dexamethasone, dexmedetomidine, digoxin, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doripenem, doxacurium, DOXOrubicin, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, epoetin alfa, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, folic acid, furosemide, gallium, ganciclovir, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, hydrOXYzine, ifosfamide, imipenem-cilastatin, indomethacin, irinotecan, isoproterenol, ketorolac, labetalol, lansoprazole, levofloxacin, lidocaine, linezolid, LORazepam, mannitol, mechlorethamine, meperidine, meropenem, methotrexate, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, micafungin, miconazole, midazolam, milrinone, minocycline, mitoXANtrone, morphine, multiple vitamins injection, nafcillin, naloxone, nesiritide, netilmicin, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, pantoprazole, papaverine, PEMEtrexed, penicillin G potassium/sodium, pentamidine, pentazocine, phentolamine, phenylephrine, phytonadione, piperacillin, piperacillin-tazobactam, polymyxin B, potassium acetate/chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, pyridoxine, quiNIDine, quinupristin-dalfopristin, raNITIdine, ritodrine, sargramostim, sodium acetate/bicarbonate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, zoledronic acid

**Solution compatibilities:** $D_5W$, NaCl 0.9%

## ADVERSE EFFECTS
**CNS:** *Tremors, headache,* seizures, confusion, progressive multifocal leukoencephalopathy, encephalopathy
**GI:** Nausea, vomiting, diarrhea, *oral candida, gum hyperplasia,* hepatotoxicity, pancreatitis
**GU:** Albuminuria, hematuria, proteinuria, renal failure, hemolytic uremic syndrome, nephrotoxicity
**INTEG:** Rash, acne, *hirsutism,* pruritus
**META:** Hyperkalemia, hypomagnesemia, hyperlipidemia, hyperuricemia
**MISC:** *Infection, hypertension*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Poorly absorbed (PO) |
| **Distribution** | Crosses placenta |
| **Metabolism** | Liver to mercaptopurine |
| **Excretion** | Kidney, minimal |
| **Half-life** | Biphasic 1.2 hr, 25 hr |

### Pharmacodynamics

| | PO |
|---|---|
| **Onset** | Unknown |
| **Peak** | 4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Allopurinol, amiodarone, amphotericin B, bromocriptine, carvedilol, cimetidine, colchicine, foscarnet, imipenem-cilastatin, melphalan, metoclopramide: increased action, cycloSPORINE toxicity

Aminoglycosides, ciprofloxacin, NSAIDs, fibric acid derivatives, vancomycin, melphalan, ketoconazole

Digoxin: increased digoxin level

Etoposide: increased etoposide level

Methotrexate: increased methotrexate level

Nafcillin, orlistat, PHENobarbital, phenytoin, terbinafine, ticlopidine, trimethoprim/sulfamethoxazole: decreased cycloSPORINE action

Sirolimus: increased sirolimus level

Tacrolimus: increased tacrolimus level

### Drug classifications:

Androgens, antifungals (azole), β-blockers, calcium channel blockers, contraceptives (oral), corticosteroids, fluoroquinolones, macrolides, NSAIDs, selective serotonin reuptake inhibitors: increased cycloSPORINE levels, toxicity

Anticonvulsants, rifamycins: decreased cycloSPORINE levels

HMG-CoA reductase inhibitors, diuretics (potassium-sparing): increased effects of each product

Live virus vaccines: decreased antibody reaction

Potassium-sparing diuretics, potassium supplements, ACE inhibitors: increase renal dysfunction

### Drug/food

Grapefruit juice, food: increased slowed metabolism of product

## NURSING CONSIDERATIONS

### Assessment

- **Posterior reversible, encephalopathy:** Assess for impaired cognition, seizures, vision changes including blindness, loss of motor function, movement disorders, psychiatric changes; dosage reduction or discontinuation may be needed in severe cases
- **Progressive multifocal leukoencephalopathy (PML):** Apathy, confusion, cognitive changes, may be fatal, withhold dose, notify prescriber immediately
- Monitor renal studies: BUN, creatinine at least monthly during treatment, 3 mo after treatment
- Monitor liver function studies: alkaline phosphatase, AST, ALT, bilirubin
- Monitor product blood levels during treatment (Therapeutic range: 100-400 mg/ml)

**BLACK BOX WARNING:** Assess for hepatotoxicity: dark urine, jaundice, itching, light-colored stools; product should be discontinued

- **Assess for nephrotoxicity:** 6 wk postop, CyA trough level >200 ng/ml, intracapsular pressure <40 mm Hg, rise in creatinine 0.15 mg/dl/day

### Patient/family education

- Advise patient to report fever, rash, severe diarrhea, chills, sore throat, fatigue, since serious infections may occur; also to report clay-colored stools, cramping (may indicate hepatotoxicity); tremors, bleeding gums, increased B/P

**BLACK BOX WARNING:** Advise patient to limit UV exposure

- **Pregnancy/breastfeeding:** Caution patient to use contraceptive measures during treatment and for 12 wk after ending therapy; product is teratogenic, to notify prescriber if pregnancy is planned or suspected
- Caution patient to avoid crowds and persons with known infections to reduce risk of infection
- Teach patient to take at the same time of day, every day; do not skip or double a missed dose; not to use with grapefruit juice or receive vaccines; there are many drug interactions, do not add or discontinue products without prescriber approval
- Teach patient that treatment is lifelong to prevent rejection; to identify signs of rejection
- Advise patient to report severe diarrhea as drug loss may result in rejection

**BLACK BOX WARNING:** Nephrotoxicity: Teach patient to notify prescriber of increased B/P, tremors of the hands, change in gums, increased hair on body/face

- Advise patient to continue with lab work and follow-up appointment
- Teach patient types of products are not interchangeable

• Teach patient not to wash syringe/container with water; a variation in dose may result
• Teach patient to notify prescriber of all medications, herbal, supplements that are taken

### Evaluation

**Positive therapeutic outcome**

• Absence of graft rejection, decreased pain in rheumatoid arthritis

**⚠ HIGH ALERT**

## cytarabine (Rx)

(sye-tare'a-been)
**Cytosar**

## cytarabine liposomal (Rx)

**Depo Cyt**

*Func. class.:* Antineoplastic, antimetabolite
*Chem. class.:* Pyrimidine nucleoside

**Do not confuse:** Cytosar/Cytovene/Cytoxan

**ACTION:** Competes with physiologic substrate of DNA synthesis, thus interfering with cell replication in the S phase of the cell cycle (before mitosis)

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** Acute myelocytic leukemia, acute lymphocytic leukemia, chronic myelocytic leukemia, lymphomatous meningitis (IT/intraventricular)

**Unlabeled uses:** Hodgkin's/non-Hodgkin's lymphoma

## CONTRAINDICATIONS

Pregnancy, hypersensitivity

**Precautions:** Renal/hepatic disease, breastfeeding, children, tumor lysis syndrome, infection, hyperkalemia, hyperphosphatemia, hyperuricemia, hypocalcemia

**BLACK BOX WARNING:** Bone marrow suppression, arachnoiditis, abdominal pain, chemotherapy-induced nausea/vomiting, diarrhea, hepatotoxicity, stomatitis, requires a specialized care setting and experienced clinician

## DOSAGE AND ROUTES

### Regimens vary acute myelogenous leukemia (AML)

**Adult:** cont **IV** infusion 100 mg/m²/day × 7 days q2wk as a single agent or 2-3 divided doses × 5-10 days until remission used in combination; maintenance 70-200 mg/m²/day × 2-5 days qmo; **SUBCUT** maintenance 100 mg/m²/day × 5 days q28days

**Adult/child: IV** For induction, 40-50 mg/kg in divided doses over 2-5 days or 10-15 mg/kg q7-10 days, 3-5 mg/kg 2 times/wk or 1-5 mg/kg daily

### Meningeal leukemia

**Adult and child:** Intrathecal For induction 50 mg (liposomal) q14 days × 2 doses (wk 1, 3); consolidation 50 mg (liposomal) q14 days × 3 doses (wk 5, 7, 9) then another dose at wk 13; maintenance 50 mg (liposomal) q28 days (wks 17, 21, 25, 29)

### Carcinomatous meningitis (liposoma)

**Adult:** Intrathecal 50 mg over 1-5 min q14days, during induction and consolidation wk 1, 3, 5, 7, 9, give another 50 mg wk 13; maintenance 50 mg q28days on wk 17, 21, 25, 29 use with dexamethasone 4 mg PO/IV × 5 days on each day of cytarabine

### Renal dose

**Adult** CCr ≤60 ml/min, serum creatinine 1.5-1.9 mg/dl or increase of 0.5-1.2 mg/dl from baseline: during treatment reduce to 1 g/m²/dose; serum creatinine ≥2 mg/dl or change from baseline serum creatinine was 1.2 mg/dl reduce to 100 mg/m²/day

**Available forms:** Powder for inj 100, 500 mg, 1, 2 g vials; sus rel (Depo Cyt) liposomal for intrathecal use 10 mg/ml

### Implementation

• Avoid contact with skin; very irritating; wash completely to remove
• Give fluids **IV** or PO before chemotherapy to hydrate patient
• Give antiemetic 30-60 min before giving product to prevent vomiting, and prn; antibiotics for prophylaxis of infection
• Increase fluids to 3 L/day
• Give in AM so product can be eliminated before bedtime
• Use cytotoxic handling precautions

**IM/SUBCUT route**

• **Reconstitute** 100 mg/5 ml or 500 mg/10 ml with bacteriostatic water for inj with benzyl alcohol 0.9%; do not use sol with precipitate; stable for 48 hr

**Intrathecal route**

• **Liposomal: withdraw** product immediately before use; **use** within 4 hr, do not save unused portions or use in-line filter; **give** directly into CSF by intraventricular reservoir or by direct inj into lumbar site
• **Give** slowly over 1-5 min; follow with lumbar puncture; instruct patient to lie flat; **give** dexamethasone 4 mg bid PO or **IV** × 5 days beginning on day of liposomal inj

**Direct IV route**
• **Dilute** 100 mg/5 ml of sterile water for inj, **give** over 1-3 min through a free-flowing IV
**Intermittent IV infusion route**
• May be further diluted in 50-100 ml NS or $D_5W$ and **give** over 30 min-24 hr, depending on dose
**Continuous IV infusion route**
• May be given as continuous IV infusion

**Y-site compatibilities:** Acyclovir, alfentanil, amifostine, amikacin, aminocaproic acid, aminophylline, amphotericin B lipid complex, amphotericin B liposome, ampicillin, ampicillin-sulbactam, amsacrine, anidulafungin, atenolol, atracurium, azithromycin, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, ceFAZolin, cefepime, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, ceftRIAXone, cefuroxime, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, cladribine, clindamycin, codeine, cyclophosphamide, cycloSPORINE, DAUNOrubicin, dexamethasone, dexmedetomidine, dexrazoxane, digoxin, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doxacurium, DOXOrubicin, DOXOrubicin liposomal, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, ertapenem, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, foscarnet, fosphenytoin, furosemide, gatifloxacin, gemcitabine, gemtuzumab, gentamicin, granisetron, haloperidol, heparin, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, inamrinone, insulin (regular), irinotecan, isoproterenol, ketorolac, labetalol, leucovorin, levofloxacin, levorphanol, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, melphalan, meperidine, meropenem, mesna, methohexital, methotrexate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, minocycline, mitoXANtrone, mivacurium, morphine, nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ofloxacin, ondansetron, oxaliplatin, PACLitaxel, palonosetron, pamidronate, pancuronium, pantoprazole, PEMEtrexed, pentamidine, PENTobarbital, PHENobarbital, phenylephrine, piperacillin, piperacillin-tazobactam, potassium chloride/phosphates, procainamide, prochlorperazine, promethazine, propofol, propranolol, quinupristin-dalfopristin, raNITIdine, rapacuronium, remifentanil, riTUXimab, rocuronium, sargramostim, sodium acetate/bicarbonate/phosphates, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, tacrolimus, teniposide, theophylline, thiopental, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA, tobramycin, trastuzumab, trimethobenzamide, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

**Additive incompatibilities:** Carbenicillin, fluorouracil, heparin, regular insulin, nafcillin, oxacillin, penicillin G sodium

**Solution compatibilities:** Amino acids, 4.25%/$D_{25}$, $D_5$/LR, $D_5$/0.2% NaCl, $D_5$/0.9% NaCl, $D_{10}$/0.9% NaCl, $D_5W$, invert glucose 10% in electrolyte #1, Ringer's LR, 0.9% NaCl, sodium lactate 1/6 mol/L, TPN #57

## ADVERSE EFFECTS

**CNS:** Neuritis, dizziness, headache, cerebellar syndrome, personality changes, ataxia, mechanical dysphasia, coma; chemical arachnoiditis (IT)
**CV:** Chest pain, cardiopathy
**EENT:** Sore throat, conjunctivitis
**GI:** *Nausea, vomiting, anorexia, diarrhea, stomatitis,* hepatotoxicity, abdominal pain, hematemesis, GI hemorrhage
**GU:** Urinary retention, renal failure, hyperuricemia
**HEMA:** Thrombophlebitis, bleeding, thrombocytopenia, leukopenia, myelosuppression, anemia
**INTEG:** *Rash, fever,* freckling, cellulitis
**META:** Hyperuricemia
**MISC:** Cytarabine syndrome—fever, myalgia, bone pain, chest pain, rash, conjunctivitis, malaise (6-12 hr after administration)
**RESP:** Pneumonia, dyspnea, pulmonary edema (high doses)
**SYST:** Anaphylaxis, tumor lysis syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete |
| **Distribution** | Widely distributed; crosses blood-brain barrier, placenta |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys |
| **Half-life** | Distribution 10 min; elimination 1-3 hr; IT 100-236 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Digoxin oral: decreased digoxin effects
Filgrastim, G-CSF, GM-CSF, sargramostim: do not use within 24 hr
Flucytosine, methotrexate: increased toxicity, immunosuppression
Gentamicin: decreased effects
Radiation: increased toxicity, bone marrow suppression

### Drug classifications

Anticoagulants, NSAIDs, platelet inhibitors, salicylates, thrombolytics: increased bleeding risk
Immunosuppressants, antineoplastics: increased toxicity, bone marrow suppression
Live virus vaccines: do not use together

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Assess buccal cavity q8hr for dryness, sores or ulceration, white patches, pain, bleeding, dysphagia; obtain prescription for viscous lidocaine (Xylocaine)

- **Assess symptoms indicating anaphylaxis:** rash, pruritus, urticaria, purpuric skin lesions, itching, flushing; resuscitation equipment should be nearby

**BLACK BOX WARNING:** Assess for chemical arachnoiditis (IT): headache, nausea, vomiting, fever; neck rigidity/pain, meningism, CSF pleocytosis; may be decreased by dexamethasone

- Assess tachypnea, dyspnea, edema, fatigue; identify dyspnea, crackles, unproductive cough, chest pain, tachypnea; pulmonary edema may be fatal (rare)
- **Assess for cytarabine syndrome 6-12 hr after infusion:** fever, myalgia, bone pain, chest pain, rash, conjunctivitis, malaise; corticosteroid may be ordered

**BLACK BOX WARNING: Bone marrow suppression:** Monitor CBC (RBC, Hct, Hgb), differential, platelet count weekly; withhold product if WBC count is $<1000/mm^3$ or platelet count is $<50,000/mm^3$ or if RBC, Hct, Hgb are low; notify prescriber of results

- Assess for increased uric acid levels, swelling, joint pain primarily in extremities; patient should be well hydrated to prevent urate deposits
- Monitor renal function studies: BUN, creatinine, serum uric acid, urine CCr before and during therapy; I&O ratio; report fall in urine output to $<30$ ml/hr
- Monitor temp q4hr (may indicate beginning of infection)

**BLACK BOX WARNING:** Hepatotoxicity: Monitor liver function tests before and during therapy (bilirubin, AST, ALT, LDH) as needed or monthly; note yellowing of skin or sclera, dark urine, clay-colored stools, pruritus, abdominal pain, fever, diarrhea; an antispasmodic may be used for GI symptoms

- Assess for bleeding: hematuria, stool guaiac, bruising or petechiae, mucosa or orifices q8hr; identify inflammation of mucosa, breaks in skin

### Patient/family education

- **Pregnancy/breastfeeding:** Advise patient that contraceptive measures are recommended during and 4 mo after therapy, do not use in pregnancy, breastfeeding
- Teach patient to avoid use of products containing aspirin or ibuprofen, NSAIDs, razors, commercial mouthwash, since bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools)
- Advise that fever, headache, nausea, vomiting are likely to occur but to continue using dexamethasone with IT administration
- Provide liquid diet: carbonated beverages; gelatin may be added if patient is not nauseated or vomiting
- Provide rinsing of mouth tid-qid with water, club soda; brushing of teeth bid-qid with soft brush or cotton-tipped applicators for stomatitis; use unwaxed dental floss
- Advise patient to report signs of anemia (fatigue, headache, irritability, faintness, shortness of breath)
- Advise patient to avoid foods with citric acid, hot flavor, or rough texture if stomatitis is present, to use sponge brush and rinse with water after each meal; to report stomatitis: any bleeding, white spots, ulcerations in mouth; tell patient to examine mouth daily, report any symptoms
- Instruct patient to report any changes in breathing or coughing even several months after treatment; to avoid crowds and persons with respiratory tract or other infections; neurotoxicity
- Caution patient not to have any vaccinations without the advice of the prescriber; serious reactions can occur
- Advise patient to take 3 L/day fluids to prevent renal damage

### Evaluation

**Positive therapeutic outcome**

- Prevention of rapid division of malignant cells

calcitonin (salmon) (Rx)
calcium carbonate (Rx) (PO-OTC, Rx)
calcium glubionate (Rx)
calcium phosphate (OTC)
capecitabine (Rx)
carBAMazepine (Rx)
carteolol ophthalmic
cefadroxil
cefditoren pivoxil
cefoTEtan
cefprozil
ceftibuten
cefuroxime
cefadroxil (Rx)
cefaclor (Rx)
cefprozil (Rx)
cefditoren pivoxil (Rx)
cefotaxime (Rx)
ceftibuten (Rx)
cephradine
cetirizine (Rx)
chlordiazePOXIDE (Rx)
cholecalciferol
cilastatin
cinacalcet (Rx)
cisatracurium (Rx)
clarithromycin (Rx)
clindamycin HCl (Rx)
clindamycin topical
clomiPRAMINE (Rx)
clopidogrel (Rx)
cloZAPine (Rx)
colesevelam (Rx)

ethinyl estradiol/drospirenone (Rx)
ethinyl estradiol/norethindrone (Rx)
mestranol/norethindrone (Rx)

ethinyl estradiol/norethindrone (Rx)
ethinyl estradiol/levonorgestrel (Rx)
levonorgestrel (Rx)
etonogestrel (Rx)

cotrimoxazole
cyclobenzaprine (Rx)
cycloSPORINE (Rx)
cytarabine liposomal (Rx)

calcitriol (Rx)
calcium chloride (Rx)

calcium gluceptate (Rx)
canagliflozin
captopril (Rx)
CARBOplatin (Rx)
carvedilol (Rx)
ceFAZolin
cefepime
cefOXitin
ceftaroline (Rx)
ceftizoxime
celecoxib (Rx)
ceFAZolin (Rx)
cefoTEtan (Rx)
cefuroxime (Rx)
(4th generation) cefepime (Rx)
cefpodoxime (Rx)
ceftizoxime (Rx)
ceritinib
cetrorelix (Rx)
chloroquine (Rx)
cholestyramine (Rx)
cilostazol (Rx)
ciprofloxacin (Rx)
CISplatin (Rx)
clavulanate
clindamycin palmitate (Rx)
clobetasol topical
clonazePAM (Rx)
clotrimazole topical
codeine (Rx)
conivaptan (Rx)

ethinyl estradiol/ethynodiol (Rx)

ethinyl estradiol/norgestimate (Rx)
ethinyl estradiol/norethindrone (Rx)
ethinyl estradiol/norgestimate (Rx)
norethindrone (Rx)

medroxyPROGESTERone (Rx)
ethinyl estradiol/etonogestrel (Rx)
crizotinib
cyclopentolate ophthalmic
cycloSPORINE, modified

calcium acetate (OTC)
calcium citrate (OTC)

calcium gluconate (Rx)
candesartan (Rx)
carbachol ophthalmic
carisoprodol (Rx)
cefaclor
cefdinir
cefotaxime
cefpodoxime
cefTAZidime
cefTRIAXone
cephalexin
cephalexin (Rx)
cefOXitin (Rx)
cefdinir (Rx)
cefixime (Rx)
cefTAZidime (Rx)
cefTRIAXone (Rx)
certolizumab pegol (Rx)
cetuximab (Rx)
chlorproMAZINE (Rx)
cidofovir (Rx)
cimetidine (OTC, Rx)
ciprofloxacin ophthalmic
citalopram (Rx)
clevidipine (Rx)
clindamycin phosphate (Rx)
clomiPHENE (Rx)
cloNIDine (Rx)
clotrimazole vaginal antifungal
colchicine (Rx)
ethinyl estradiol/desogestrel (Rx)
ethinyl estradiol/levonorgestrel (Rx)
ethinyl estradiol/norgestrel (Rx)

ethinyl estradiol/desogestrel (Rx)
ethinyl estradiol/levonorgestrel (Rx)
ethinyl estradiol/norethindrone acetate (Rx)
levonorgestrel (Rx)
ethinyl estradiol/norelgestromin (Rx)
crofelemer
cyclophosphamide (Rx)
cytarabine (Rx)

## dabigatran (Rx)

(da-bye-gat'ran)
**Pradaxa**
*Func. class.:* Anticoagulant
*Chem. Class.:* Thrombin inhibitor

**ACTION:** Direct thrombin inhibitor that inhibits both free and clot-bound thrombin, prevents thrombin-induced platelet aggregation and thrombus formation by preventing conversion of fibrinogen to fibrin

**Therapeutic outcome:** Decreased thrombus formation/extension, absence of emboli, postthrombotic effects

**USES:** Stroke/systemic embolism prophylaxis with nonvalvular atrial fibrillation, DVT, pulmonary embolism in hip replacement

## CONTRAINDICATIONS

Hypersensitivity, bleeding

**Precautions:** Abrupt discontinuation, anticoagulant therapy, breastfeeding, pregnancy, children, geriatrics, labor, obstetric delivery, renal disease, surgery

**BLACK BOX WARNING:** Abrupt discontinuation, epidural/spinal anesthesia, lumbar puncture

## DOSAGE AND ROUTES

### Stroke prophylaxis

**Adult:** PO 150 mg bid
CCr more than 30 ml/min: No dosage adjustment; CCr 15 to 30 ml/min: 75 mg bid;
CCr <15 ml/min: Dosing recommendations are not provided by the manufacturer

### With concomitant use of P-glycoprotein (P-gp) inhibitors:

CCrl 30 to 50 ml/min: 75 mg bid when used with the P-gp inhibitors dronedarone or ketoconazole; dose adjustment is not necessary when used with other P-gp inhibitors; CCr <30 ml/min: Avoid use

### For conversion from dabigatran to parenteral anticoagulants

**Adult:** PO discontinue dabigatran, start parenteral anticoagulant 12 hr (CCR ≥30 ml/min), 24 hr (CCR <30 ml/min) after the last dabigatran dose

### Deep vein thrombosis/pulmonary embolism/treated with a parenteral anticoagulant × 5-10 days

**Adult:** PO 150 mg bid
CCr >30 ml/min: No change; CCr 30 ml/min or less: Dosing recommendations are not provided by the manufacturer

### With concomitant use of P-glycoprotein (P-gp) inhibitors:

CCr <50 ml/min: Avoid use

**Available forms:** Cap 75, 150 mg

### Implementation

- Before surgery, discontinue product, restart after surgery is completed
- Do not crush, break, chew, or empty contents of capsule
- Take without regard to food
- Store in original package until time of use at room temperature, discard after 30 days, protect from moisture

## ADVERSE EFFECTS

**CV:** Myocardial infarction
**GI:** Abdominal pain, dyspepsia, peptic ulcer, esophagitis, GERD, gastritis
**HEMA:** Bleeding (any site)
**SYST:** Anaphylaxis (rare), angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 7% |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Feces 86% |
| **Half-life** | 12-17 hr (extended in renal disease) |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1 hr; high-fat meal delays peak |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Amiodarone, clopidogrel, ketoconazole, quiNIDine, verapamil: increased bleeding risk, avoid use in those with renal disease (CCr 15-30 ml/min)
RifAMPin: decreased dabigatran effect, avoid use

### Drug classifications

Anticoagulants, antiplatelets, antifibrinolytics; NSAIDs (chronic use), thrombolytics: increased bleeding risk, dose should be reduced to 150 mg/day (75 mg bid) in those with CCr 30-50 ml/min

### Drug/herb

Garlic, ginger, Ginkgo biloba: Increased bleeding risk, avoid use
St. John's wort: decreased dabigatran effect, avoid use

## NURSING CONSIDERATIONS

### Assessment

- **Assess for bleeding:** blood in urine or emesis, dark tarry stools, lower back pain. Caution with arterial/venous punctures, catheters, NG tubes. Monitor vital signs frequently. The elderly are more prone to serious bleeding
- **Assess for thrombosis/MI/emboli:** swelling, pain, redness, difficulty breathing, chest pain, tachypnea, cough, coughing up blood, cyanosis

**BLACK BOX WARNING:** Epidural/spinal anesthesia, lumbar puncture

- Teach patient risk of hematoma that may cause paralysis, indwelling epidural catheters and products that cause coagulation may increase the risk of paralysis
- **Assess for postthrombotic syndrome:** pain, heaviness, itching/tingling, swelling, varicose veins, brownish/reddish skin discoloration, ulcers; ambulation, compression stockings and adequate anticoagulation can prevent this syndrome
- Monitor serum creatinine

**BLACK BOX WARNING:** Do not discontinue abruptly

### Patient/family education

- Explain the purpose and expected results of this product, store in original container, protect from moisture

**BLACK BOX WARNING: Neurologic changes:** To report bladder or bowel changes, numbness in lower extremities, back pain; notify prescriber immediately

- If dose is missed take as soon as remembered if on the same day, do not administer if <6 hr before next dose
- Instruct patient to report if bleeding or bruising is present, check with prescriber about when to discontinue
- Advise patient not to use any other OTC products, herbs without prescriber approval
- Inform patient that lab tests will be required during treatment
- Advise patient to keep dry, do not use other containers

### Evaluation

#### Positive therapeutic outcome

- Decreased thrombus formation/extension, absence of emboli, postthrombotic effects

## dabrafenib

(da-braf'e-nib)

**Tafinlar**

*Func. class.:* Antineoplastic

*Chem. class.:* Signal transduction inhibitor, kinase inhibitor

**ACTION:** Inhibits kinase, inhibitor against mutated forms of BRAF kinases in melanoma cells

**Therapeutic outcome:** Decrease in melanoma progression

**USES:** Unresectable or metastatic BRAD V600E-mutated malignant melanoma, or *V600K*-mutated melanoma in combination with trametinib

## CONTRAINDICATIONS

Pregnancy, hypersensitivity

**Precautions:** Breastfeeding, children, infection, dehydration, diabetes mellitus, fever, G6PD deficiency, hemolytic anemia, hyperglycemia, hypotension, infertility, iritis, renal failure, secondary malignancy

## DOSAGE AND ROUTES

**Adult: PO** 150 mg q12hr until disease progression, avoid strong CYP3A4/CYP2C8 inhibitors or inducers

**Available forms:** Caps 50, 75 mg

### Implementation

**PO route**

- Swallow whole
- If dose is missed, take within 6 hr of missed dose, if >6 hr have passed, skip dose
- Space doses q12hr
- Take at least 1 hr before or 2 hr after a meal

## ADVERSE EFFECTS

**EENT:** Uveitis, retinal detachment
**CNS:** Headache, fever
**GI:** Pancreatitis
**CV:** Cardiomyopathy
**INTEG:** Rash, alopecia
**MISC:** Arthralgia, back pain, **hand-foot syndrome**, hyperglycemia, hypophosphatemia, hyponatremia, myalgia, secondary malignancy

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 99.7% |
| **Metabolism** | Unknown |
| **Excretion** | 71% (feces), 23% (urine) |
| **Half-life** | 8 hr (dabrafenib), 10 hr, 21-22 hr metabolites |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Antacids, CYP3A4 inducers (dexamethasone, phenytoin, carBAMazepine, rifAMPin, PHENobarbital), proton-pump inhibitors: decreased dabrafenib concentrations

CYP3A4 inhibitors (ketoconazole, itraconazole, erythromycin, clarithromycin): altered dabrafenib concentrations

### Drug/food

Grapefruit juice: increased dabrafenib effect; avoid use while taking product

### Drug/herb

St. John's wort: decreased dabrafenib concentrations

## NURSING CONSIDERATIONS

### Assessment

- **Secondary malignancy:** Has been reported with monotherapy; cutaneous squamous cell carcinoma (cuSCC), keratoacanthoma, and new primary malignant melanomas are increased when used in combination with trametinib, usually within 9 wk (cutaneous squamous cell carcinoma); basal cell carcinoma (4-36 wk). Perform a dermatologic evaluation before therapy, q2mo while on therapy, and for up to 6 mo after discontinuing therapy
- **Serious fever and febrile reaction:** Hypotension, rigors/chills, dehydration, renal failure may occur; the incidence and severity of fever are higher when given with trametinib. Interruption of therapy, a dose reduction, or permanent therapy discontinuation may be needed. Monitor for signs and symptoms of infection. If a severe fever or febrile reaction occurs, monitor renal function (BUN/serum creatinine) during and after the event and give antipyretic agents when therapy is resumed. In those who develop a febrile reaction that does not resolve within 3 days of onset, give corticosteroids (prednisone 10 mg/day PO) for at least 5 days; ensure there is no evidence of active infection before starting corticosteroids
- **Hyperglycemia:** The incidence and severity of hyperglycemia were higher when given with this product. Those with diabetes mellitus may require more intensive hypoglycemic therapy. Monitor serum glucose levels at baseline and as clinically indicated; advise patients to report symptoms of severe hyperglycemia (excessive thirst, increased urinary frequency)
- **Uveitis, iritis, and iridocyclitis:** Steroid and mydriatic ophthalmic drops may provide symptomatic relief for these conditions. Monitor for visual signs and symptoms of uveitis (blurred vision, photophobia, and eye pain). Continue at the same dose in iritis. Hold for mild or moderate uveitis that does not respond to ocular therapy, severe uveitis, or iridocyclitis; initiate treatment as indicated. Permanently discontinue in those who develop persistent grade 2 or higher uveitis that lasts longer than 6 wk
- **Bleeding:** Major intracranial bleeding/GI bleeding can occur when used in combination with trametinib. Monitor for signs of bleeding; evaluate any unexplained fall in hematocrit, hypotension
- **Cardiomyopathy:** A decrease in left ventricular ejection fraction (LVEF) of 10% or greater from baseline and below the lower limit of normal (LLN) may occur and was higher when given in combination with trametinib. Obtain an echocardiogram or multigated acquisition (MUGA) scan before starting combination therapy, 1 month after starting dabrafenib, and then q2-3mo during treatment. Hold dabrafenib for symptomatic congestive heart failure or LVEF below the LLN with an absolute decrease of greater than 20% from baseline. Resume dabrafenib at the same dose if LVEF improves to the institutional LLN and an absolute decrease of 10% or less from baseline
- **Palmar-plantar erythrodysesthesia syndrome (hand and foot syndrome):** May occur when given in combination with trametinib, usually within 37 days; hospitalization may be required due to a secondary infection of the skin. Interruption of therapy, a dose reduction, or permanent therapy discontinuation may be needed in those who develop severe skin toxicity
- **Pregnancy:** Identify if pregnancy is planned or suspected, if contraception is used, or if breastfeeding

### Patient/family education

- Advise patient to notify prescriber of new lesions
- Teach patient to notify all providers of all OTC, Rx, herbal products taken
- Teach patient to take as prescribed 1 hr before or 2 hr after meals, take a missed dose within 6 hr of next dose
- **Pregnancy:** Identify if pregnancy is planned or suspected, and contraception used, if breastfeeding
- Instruct patient to report adverse reactions immediately
- Teach patient about reason for treatment, expected results

• **Pregnancy:** Instruct patient to use effective nonhormonal contraception during treatment, after discontinuing treatment, do not breastfeed

### Evaluation

**Positive therapeutic outcome**
• Decrease in melanoma progression

**⚠ HIGH ALERT**

## dacarbazine (Rx)

(da-kar'ba-zeen)
**DTIC ✱, DTIC-Dome**
*Func. class.:* Antineoplastic—miscellaneous agent
*Chem. class.:* Imidazole

**ACTION:** Alkylates DNA, RNA; inhibits RNA, DNA synthesis; also responsible for breakage, cross-linking DNA strands; activity is not cell cycle phase specific

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** Hodgkin's disease, malignant melanoma

**Unlabeled uses:** Malignant pheochromocytoma in combination with cyclophosphamide and vinCRIStine, metastatic soft tissue sarcoma in combination with other agents, carcinoma meningitis, neuroblastoma

## CONTRAINDICATIONS

Hypersensitivity, breastfeeding

**Precautions:** Renal disease, infection

**BLACK BOX WARNING:** Pregnancy (1st trimester), radiation therapy, hepatic disease, bone marrow suppression, secondary malignancy, requires an experienced clinician

## DOSAGE AND ROUTES

### Metastatic malignant melanoma

**Adult: IV** 2-4.5 mg/kg daily × 10 days or 100-250 mg/m² daily × 5 days; repeat q3wk depending on response

### Hodgkin's disease

**Adult: IV** 150 mg/m² daily × 5 days with other agents, repeat q4wk or 375 mg/m² on days 1 and 15 when given in combination, repeat q28day

### Osteogenic sarcoma (unlabeled)

**Adult and child: IV** 250 mg/m²/day as a cont INF × 4 days in combination with other agents q28day

### Soft tissue sarcoma (unlabeled)

**Adult and child: IV** 250-300 mg/m²/day as a cont INF × 3 days q21-28day

**Available forms:** Powder for inj 10, 100, 200 mg

### Implementation

• Give fluids **IV** or PO before chemotherapy to hydrate patient
• Nausea/vomiting may be severe and last several hours
• Give antiemetic 30-60 min before giving product to prevent vomiting, and prn; antibiotics for prophylaxis of infection
• Provide liquid diet: carbonated beverages; gelatin may be added if patient is not nauseated or vomiting
• Clarify all orders, double-check original order, may be fatal if wrong dose is given

**Direct IV route**
• After diluting 100 mg/9.9 ml or 200 mg/19.7 ml of sterile water for inj (10 mg/ml), give by direct **IV** over 2-3 min through Y-tube or 3-way stopcock

**Intermittent IV infusion route**
• May be further diluted in 50-250 ml of $D_5W$ or normal saline for inj and given over 30 min
• Watch for extravasation; stop infusion, apply ice to area
• Store in light-resistant container in a dry area

**Y-site compatibilities:** Amifostine, aztreonam, filgrastim, fludarabine, granisetron, melphalan, ondansetron, PACLitaxel, sargramostim, teniposide, thiotepa, vinorelbine

## ADVERSE EFFECTS

**CNS:** Facial paresthesia, flushing, fever, malaise, confusion, headache, seizures, cerebral hemorrhage, blurred vision (high doses)
**GI:** *Nausea, anorexia, vomiting,* hepatotoxicity
**HEMA:** Thrombocytopenia, leukopenia, anemia
**INTEG:** *Alopecia,* dermatitis, pain at inj site, photosensitivity, severe sun reactions (high doses)
**MISC:** Flulike symptoms, malaise, fever, myalgia, hypotension
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete bioavailability (**IV**) |
| **Distribution** | Widely distributed; concentrates in liver |
| **Metabolism** | Liver (50%, 5% protein bound) |
| **Excretion** | Kidneys, unchanged (50%) |
| **Half-life** | Terminal 19 min; 5 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

PHENobarbital, phenytoin: increased metabolism; decreased dacarbazine effect
Radiation: bone marrow suppression, toxicity

### Drug classifications

Aminoglycosides: increased nephrotoxicity
Anticoagulants, NSAIDs, salicylates: increased risk of bleeding
Antineoplastics, bone marrow–suppressing products: increased toxicity, bone marrow suppression
Diuretics, loop: increased ototoxicity
Live virus vaccines: increased adverse reactions; decreased antibody reaction

### Drug/Lab

Increase: BUN, AST, ALT
Decrease: Platelets, WBC, RBC

## NURSING CONSIDERATIONS

### Assessment

- **Assess symptoms indicating severe allergic reaction:** rash, pruritus, urticaria, purpuric skin lesions, itching, flushing; product should be discontinued

**BLACK BOX WARNING: Assess for bone marrow suppression:** Monitor CBC, differential, platelet count weekly; withhold product if WBC is $<4000/mm^3$ or platelet count is $<75,000/mm^3$

- Monitor renal function tests: BUN, creatinine, urine CCr before, during therapy; I&O ratio; report fall in urine output to <30 ml/hr
- Monitor temp q4hr (may indicate beginning of infection), I&O, for nausea, appetite

**BLACK BOX WARNING: Hepatotoxicity:** Monitor liver function tests before, during therapy (bilirubin, AST, ALT, LDH) as needed or monthly; note jaundice of skin or sclera, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea; hepatotoxicity can be serious and fatal

- Assess for **bleeding:** hematuria, stool guaiac, bruising or petechiae, mucosa or orifices q8hr; check for inflammation of mucosa, breaks in skin

**BLACK BOX WARNING:** Product must be administered by those experienced in the use of cancer chemotherapy

- Assess IV site for irritation, redness, pain; if infiltration occurs use hot packs at site
- Identify effects of alopecia on body image; discuss feelings about body changes

**BLACK BOX WARNING: Secondary malignancy:** Assess for secondary malignancy that may occur with this product

### Patient/family education

- Teach patient to avoid use of products containing aspirin or ibuprofen, razors, commercial mouthwash, since bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools)
- Advise patient that hair may be lost during treatment; a wig or hairpiece may make patient feel better; new hair may be different in color, texture
- Caution patient not to have any vaccinations without the advice of prescriber; serious reactions can occur

**BLACK BOX WARNING: Pregnancy: to notify prescriber if pregnancy is planned or suspected.** Advise patient contraception is needed during treatment and for several months after the completion of therapy; product has teratogenic properties

- **Teach patient to report signs of infection:** fever, sore throat, flulike symptoms

### Evaluation

**Positive therapeutic outcome**

- Prevention of rapid division of malignant cells

## daclatasvir

(dak-lat'-as-vir)
**Daklinza**
*Func. class.:* Antiviral, antihepatitis agent

**ACTION:** Active against chronic infections caused by genotype 3 hepatitis C virus (HCV); prevents viral RNA replication by impairing protein function

**Therapeutic outcome:** Decreased symptoms of chronic hepatitis C

**USES:** Chronic hepatitis C, genotype 3 with complicated liver disease

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy (**UK**) breastfeeding, antimicrobial resistance, hepatic disease, hepatitis C with HIV coinfection, liver transplant

## DOSAGE AND ROUTES

### For the treatment of chronic hepatitis C infection (HCV)

Daclatasvir must be administered in combination with sofosbuvir; certain patients may also require treatment with ribavirin. If sofosbuvir is permanently discontinued, daclatasvir must also be discontinued

### For the treatment of chronic HCV genotype 1 infection

Cirrhotic patients infected with HCV genotype 1a should undergo testing for the presence of NS5A resistance-associated polymorphisms before initiating therapy; specifically, polymorphisms at amino acid positions M28, Q30, L31, and Y93

The optimal treatment duration has not been established for genotype 1–infected patients with decompensated (Child-Pugh C) cirrhosis

**Adults without cirrhosis or who have compensated (Child-Pugh A): PO** 60 mg once daily in combination with sofosbuvir 400 mg PO once daily for 12 wk. Dosing includes patients coinfected with HIV

**Adults receiving strong CYP3A inhibitors who do not have cirrhosis or who have compensated (Child-Pugh A) cirrhosis: PO** 30 mg once daily in combination with sofosbuvir 400 mg PO once daily for 12 wk. Dosing includes patients coinfected with HIV

**Adults receiving moderate CYP3A inducers who do not have cirrhosis or who have compensated (Child-Pugh A) cirrhosis: PO** 90 mg once daily in combination with sofosbuvir 400 mg PO once daily for 12 wk. Dosing includes patients coinfected with HIV

**Adults who have decompensated cirrhosis or who have undergone liver transplantation: PO** 60 mg once daily in combination with sofosbuvir (400 mg PO once daily) and ribavirin (600 mg PO once daily) for 12 wk. Ribavirin must be administered with food, and the dose may be increased to 1000 mg PO daily if tolerated; consider decreasing ribavirin dose for abnormal hemoglobin or creatinine clearance. Dosing includes patients coinfected with HIV

**Adults receiving strong CYP3A inhibitors who have decompensated cirrhosis or who have undergone liver transplantation: PO** 30 mg once daily in combination with sofosbuvir (400 mg PO once daily) and ribavirin (600 mg PO once daily) for 12 wk. Ribavirin must be administered with food, and the dose may be increased to 1000 mg PO daily if tolerated; consider decreasing ribavirin dose for abnormal hemoglobin or creatinine clearance. Dosing includes patients coinfected with HIV

**Adults receiving moderate CYP3A inducers who have decompensated cirrhosis or who have undergone liver transplantation:** 90 mg once daily in combination with sofosbuvir (400 mg PO once daily) and ribavirin (600 mg PO once daily) for 12 wk. Ribavirin must be administered with food, and the dose may be increased to 1000 mg PO daily if tolerated; consider decreasing ribavirin dose for abnormal hemoglobin or creatinine clearance. Dosing includes patients coinfected with HIV

### For the treatment of chronic HCV genotype 3 infection

The optimal treatment duration has not been established for genotype 3–infected patients with cirrhosis.

**Adults without cirrhosis: PO** 60 mg once daily in combination with sofosbuvir 400 mg PO once daily for 12 wk. Dosing includes patients coinfected with HIV

**Adults without cirrhosis receiving strong CYP3A inhibitors: PO** 30 mg once daily in combination with sofosbuvir 400 mg PO once daily for 12 wk. Dosing includes patients coinfected with HIV

**Adults without cirrhosis receiving moderate CYP3A inducers: PO** 90 mg once daily in combination with sofosbuvir 400 mg PO once daily for 12 wk. Dosing includes patients coinfected with HIV

**Adults with compensated cirrhosis: PO** 60 mg once daily in combination with sofosbuvir (400 mg PO once daily) and ribavirin for 12 wk. Ribavirin must be administered with food in two divided doses, and the dose is based on weight as follows: less than 75 kg, give 500 mg PO twice daily; 75 kg or more, give 600 mg PO twice daily. Dosing includes patients coinfected with HIV

**Adults receiving strong CYP3A inhibitors who have compensated cirrhosis: PO** 30 mg once daily in combination with sofosbuvir (400 mg PO once daily) and ribavirin for 12 wk. Ribavirin must be administered with food in two divided doses, and the dose is based on weight as follows: less than 75 kg, give 500 mg PO twice daily; 75 kg or more, give 600 mg PO twice daily. Dosing includes patients coinfected with HIV

**Adults receiving moderate CYP3A inducers who have compensated cirrhosis: PO** 90 mg once daily in combination with sofosbuvir (400 mg PO once daily) and ribavirin for 12 wk. Ribavirin must be administered with food in two divided doses, and the dose is based on weight as follows: less than 75 kg, give 500 mg PO twice daily; 75 kg or more, give 600 mg PO twice daily. Dosing includes patients coinfected with HIV

**Adults with decompensated cirrhosis or who have undergone liver transplantation: PO** 60 mg once daily in combination with sofosbuvir (400 mg PO once daily) and ribavirin

(600 mg PO once daily) for 12 wk. Ribavirin must be administered with food, and the dose may be increased to 1000 mg PO daily if tolerated; consider decreasing ribavirin dose for abnormal hemoglobin or creatinine clearance. Dosing includes patients coinfected with HIV

**Adults receiving strong CYP3A inhibitors who have decompensated cirrhosis or who have undergone liver transplantation: PO** 30 mg once daily in combination with sofosbuvir (400 mg PO once daily) and ribavirin (600 mg PO once daily) for 12 wk. Ribavirin must be administered with food, and the dose may be increased to 1000 mg PO daily if tolerated; consider decreasing ribavirin dose for abnormal hemoglobin or creatinine clearance. Dosing includes patients coinfected with HIV

**Adults receiving moderate CYP3A inducers who have decompensated cirrhosis or who have undergone liver transplantation:** 90 mg once daily in combination with sofosbuvir (400 mg PO once daily) and ribavirin (600 mg PO once daily) for 12 wk. Ribavirin must be administered with food, and the dose may be increased to 1000 mg PO daily if tolerated; consider decreasing ribavirin dose for abnormal hemoglobin or creatinine clearance. Dosing includes patients coinfected with HIV

**Adults: PO** 60 mg qday with sofosbuvir 400 mg qday × 12 wk

**Adults receiving strong CYP3A inhibitors: PO** 30 mg qday with sofosbuvir 400 mg qday × 12 wk

**Adults receiving moderate CYP3A inducers: PO** 90 mg qday with sofosbuvir 400 mg qday × 12 wk

**Available forms:** Tabs 30, 60 mg

### Implementation

- Give by mouth without regard to food
- Do not use as monotherapy, must be given with sofosbuvir

## ADVERSE EFFECTS

**CNS:** Headache, fatigue
**GI:** Diarrhea, nausea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 99% protein binding |
| **Metabolism** | Liver, by CYP3A4, affected by P-glycoprotein (P-gp), organic anion transporting polypeptides (OATP1B1 and OATP1B3), breast cancer resistance protein (BCRP) |
| **Excretion** | Feces 88% |
| **Half-life** | Terminal half-life 12-15 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Do not use with potent CYP3A4 inducers
P-glycoprotein(P-gp) substrates: increase of each product
Potent CYP3A4 inhibitors: Increased daclatasvir effect, reduce dose of daclatasvir
Moderate CYP3A4 inducers. Decreased daclatasvir effect, increase dose of daclatasvir

## NURSING CONSIDERATIONS

### Assessment

- **Liver transplant/cirrhosis:** May have lower sustained virologic response rates in cirrhosis and use in prior liver transplant is unknown
- **HIV/ hepatitis C coinfection:** All patients with HIV infection should be tested for hepatitis C, with continued annual screening advised for those persons considered high risk for acquiring hepatitis C. If hepatitis C and HIV coinfection is identified, consider treating both viral infections concurrently.
- **Pregnancy/breastfeeding:** Unknown, give careful consideration for use in pregnancy and breastfeeding
- **Strong CYP3A4 inducers:** Do not use concurrently, may lead to treatment failure, review patient's medication profile for potential drug interactions before starting treatment
- **Hepatitis C:** Monitor plasma hepatitis C RNA and plasma HIV RNA baseline and during treatment

### Patient/family education

- Teach patient that optimal duration of treatment is 12 wk; that product is not a cure; that transmission may still occur and must be taken with sofosbuvir
- Inform patient to avoid use with other medications, herbs, supplements unless approved by prescriber
- Teach patient not to stop abruptly unless directed; worsening of hepatitis may occur
- Advise patient to notify prescriber if pregnancy is planned or suspected or if breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Therapeutic response: decreased symptoms of chronic hepatitis C

## daclizumab

(dah-klihzyoo-mab)

**Zinbryta**

*Func. class.:* Immunosuppressive, interleukin inhibitor

**ACTION:** Binds to a subunit of the interleukin (IL)-2 receptor (IL-2Rα) and inhibits the binding of IL-2 to IL-2Rα. By inhibiting the binding of IL-2 to this receptor, T-cell activation is blocked

**Therapeutic outcome:** Improvement in symptoms of multiple sclerosis

**USES:** Relapsing multiple sclerosis, kidney transplant prophylaxis with other agents

## CONTRAINDICATIONS

Murine protein hypersensitivity

**BLACK BOX WARNING:** Hepatic disease, hepatitis

## PRECAUTIONS

Breastfeeding, children, depression, eczema, infection, lymphoma, neoplastic disease, pregnancy, psoriasis, requires a specialized care setting, requires an experienced clinician, suicidal ideation, vaccination, varicella

## DOSAGE AND ROUTES

**Adult: SUBCUT** 150 mg injected monthly

### Kidney transplant rejection prophylaxis

**Adult/adolescent/child/infant 11 months and older:** 1 mg/kg **IV**, followed by 4 more doses of 1 mg/kg **IV** q2wk; the initial dose should be given not more than 24 hr before transplantation

**Available forms:** Injection 150 mg/ml

### Implementation

**Subcut route: Zinbryta formulation**

- Visually inspect parenteral products for particulate matter and discoloration before administration whenever solution and container permit
- Prefilled syringes are for single use only
- Allow to warm to room temperature 30 min before use. Do not use external heat sources. Do not place back in the refrigerator after allowing to warm to room temperature
- Do not use if the solution is cloudy or there are visible particles
- Inject into the thigh, abdomen, or back of the upper arm
- If a dose is missed, inject it as soon as possible. If a dose is more than 2 wk late, skip the missed dose and take the next dose on schedule

## ADVERSE EFFECTS

**CNS:** *Depression*
**EENT:** *Pharyngitis*
**Integ:** *Rash*
**Misc:** Infection

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Bioavailability 90%, steady state by 4th dose |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Elimination half-life 20 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 5-7 days |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

- Do not use with vaccines
- Increased: infection, immunosuppressives, antineoplastics, tumor necrosis factors

## NURSING CONSIDERATIONS

### Assessment

- **Multiple sclerosis:** Product should only be used in those who have not responded to other treatment. Monitor symptoms, including muscle weakness, gait, respiratory changes.
- **Infection:** Opportunistic infections occur often with this product, monitor temperature, sore throat, cough, injection-site reactions. Evaluate patients at high risk for TB before use, for those who test positive for TB, treat by standard clinical practices before starting treatment. Do not use in those with TB or other severe active infection. If serious infection develops, consider withholding treatment until the infection resolves. Some infections may be fatal.

**BLACK BOX WARNING: Hepatic disease:** Monitor ALT or AST; if these results are at least 2 times the upper limit of normal (ULN), or if patient has a history of autoimmune hepatitis or other autoimmune disease involving the liver, do not use. Monitor ALT, AST, total bilirubin qmo × 6 mo after the last dose. Modify treatment if any of these occur: If ALT or AST >5 times ULN, total bilirubin >2 times the ULN, or ALT or AST ≥3 but <5 times ULN and total bilirubin >1.5 but <2 times ULN, interrupt therapy. If a patient develops clinical signs or symptoms of hepatic dysfunction (nausea, vomiting, abdominal pain, fatigue, jaundice, dark urine), measure serum transaminases and total bilirubin or discontinue treatment. Discontinue if autoimmune hepatitis is suspected; treatment with immunosuppressant drugs may be necessary. Concomitant use of hepatotoxic drugs, including nonprescription drugs, dietary supplements, or herbal products, may increase the risk for liver injury

- **Depression:** Assess for depression, suicidal ideation, or suicide attempts. Advise patients and/or caregivers to report any symptoms of new or worsening depression and/or suicidal ideation to their health care provider

### Patient/family education

- **Infection:** Teach patient to report fever, sore throat, cough, injection-site reactions
- **Depression:** Advise patients and/or caregivers to report any symptoms of new or worsening depression and/or suicidal ideation to their health care provider

**BLACK BOX WARNING: Hepatic disease:** Advise patient to report to provider nausea, vomiting, abdominal pain, fatigue, jaundice, dark urine, lab tests will be needed

### Evaluation

- Improvement in symptoms of multiple sclerosis

## dalbavancin

(dal-ba-van'sin)

**Dalvance**

*Func. class.:* Antiinfective-glycopeptide

**ACTION:** Binds to the bacterial cell walls, inhibiting their synthesis

**Therapeutic outcome:** Decreased symptoms of infection, negative C&S

**USES:** Treatment of acute bacterial skin and skin structure infections caused by gram-positive organisms (cellulitis, major abscess, wound infections)

**CONTRAINDICATIONS:** Hypersensitivity

**Precautions:** Antimicrobial resistance, breastfeeding, colitis, diarrhea, GI disease, inflammatory bowel disease, infusion-related reactions, pregnancy, pseudomembranous colitis, ulcerative colitis, vancomycin hypersensitivity, viral infection

D

## DOSAGE AND ROUTES

**Adult: IV** 1000 mg once, then 500 mg **IV** 1 wk later

### Renal dose

**Adult:** IV CCr <30 ml/min, 1125 mg as a single dose or 750 mg once then 375 mg 1 week later

**Available forms:** Powder for injection 500 mg

### Implementation

**IV infusion route**

- Visually inspect parenteral products for particulate matter and discoloration
- **Reconstitution:** Reconstitute each 500 mg/25 ml sterile water for injection; to avoid foaming, alternate between gentle swirling and inversion until completely dissolved, do not shake; further dilution is required
- **Storage:** Refrigerate or store at room temperature. Do not freeze. Total time from reconstitution to dilution to use should not exceed 48 hr
- **Dilution:** Transfer the dose of reconstituted solution from the vial(s) to an IV bag or bottle containing $D_5W$ (1-5 mg/ml)

**Intermittent IV INF**

- Give over 30 min, do not infuse with other medications or electrolytes
- Saline-based infusion solutions may cause precipitation and should not be used
- If a common IV line is being used to administer other drugs, the line should be flushed before and after each dose

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, flushing
**GI:** Nausea, vomiting, pseudomembranous colitis, GI bleeding, abdominal pain, diarrhea
**HEMA:** Thrombocytopenia, neutropenia, leukopenia, anemia
**INTEG:** Rash, urticaria, infusion-related reactions, pruritus
**SYST:** Red man syndrome, hypersensitivity reactions

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 93%, primarily to albumin |
| **Metabolism** | Decreased in renal disease |
| **Excretion** | Feces and urine |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Oral contraceptives: decreased with prolonged use

### Drug/lab test

Increased: LFTs, INR, alkaline phosphatase
Decrease: Platelets, WBC

## NURSING CONSIDERATIONS

### Assessment

- **Assess:** BUN/creatinine, lower dose may be required in severe renal disease
- **Pseudomembranous colitis:** bowel pattern daily, if severe diarrhea occurs, product should be discontinued
- IV site for INF-site reactions
- **Anaphylaxis:** rash, urticaria, pruritus, wheezing, may occur a few days after administration
- Red man–like syndrome: flushing, rash over upper torso and neck, may occur after a few minutes of infusion, may be treated with antihistamines and a slower infusion

### Patient/family education

- Teach patient to report sore throat, bruising, bleeding, joint pain (blood dyscrasias), diarrhea with mucus, blood (pseudomembranous colitis), rash, pruritus, wheezing, hypersensitivity reactions
- **Pregnancy/breastfeeding.** Advise patient to use nonhormonal contraceptive if on long-term therapy
- Teach patient to notify all prescribers of all OTC, Rx, herbals

### Evaluation

#### Positive therapeutic outcome

- Decreased symptoms of infection, negative C&S

## dalfampridine (Rx)

(dal-fam′pri-deen)
**Ampyra, Fampyra**
*Func. class.:* Neurological agent—MS
*Chem. class.:* Broad-spectrum potassium channel blocker

**ACTION:** Mechanism of action is not fully understood, a broad-spectrum potassium channel blocker inhibits potassium channels and increased action potential conduction in demyelinated axons

**Therapeutic outcome:** Ability to walk at improved speed in MS

**USES:** For improved walking in patients with multiple sclerosis

## CONTRAINDICATIONS

Renal failure (CCr <50 ml/min), seizures

**Precautions:** Pregnancy, breastfeeding, renal disease, elderly

## DOSAGE AND ROUTES

**Adult:** PO 10 mg q12hr

### Renal dose

**Adult:** PO CCr 51-80 ml/min no dosage adjustment needed, but seizure risk is unknown; CCr ≤50 ml/min, do not use

**Available forms:** Ext rel tab 10 mg

### Implementation

- Do not break, crush, or chew; give without regard to meals
- Do not give closer together than q12hr, seizures may occur
- Do not double doses, if a dose is missed, skip it

## ADVERSE EFFECTS

**CNS:** Seizures, paresthesias, headache, dizziness, asthenia, insomnia
**GI:** Nausea, constipation, dyspepsia
**GU:** Urinary tract infection
**MS:** Back pain
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Bioavailability 96% |
| **Distribution** | Largely unbound to plasma proteins |
| **Metabolism** | Unknown |
| **Excretion** | 96% is recovered in the urine |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 3-4 hr (fasting), longer if taken with food |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Fampridine: do not use together

### Drug classifications

4-aminopyridine (4-AP)-containing products: do not use together

## NURSING CONSIDERATIONS

### Assessment

- **Multiple sclerosis:** assess walking, including speed
- **Assess for seizures:** more common in those with previous seizure disorder, risk increases with higher doses
- **Anaphylaxis:** Wheezing, rash, urticaria, pruritus, angioedema
- **Pregnancy/breastfeeding:** No well-controlled studies, avoid use in pregnancy, breastfeeding

### Patient/family education

- Advise patient to notify prescriber if pregnancy is planned or suspected, do not breastfeed
- Teach patient about expected results, side effects including seizures
- Teach patient to notify prescriber of all OTC/Rx/herbals taken
- **Anaphylaxis:** Teach patient to notify prescriber immediately of wheezing, throat tightening, rash, swelling of face, lips
- **Seizures:** Teach patient to notify prescriber immediately

### Evaluation

#### Positive therapeutic outcome

- Ability to walk at improved speed in MS

**⚠ HIGH ALERT**

## dalteparin (Rx)

(dahl′ta-pear-in)

**Fragmin**

*Func. class.:* Anticoagulant

*Chem. class.:* Low-molecular-weight heparin

**ACTION:** Inhibits factor Xa/IIa (thrombin), resulting in anticoagulation

**Therapeutic outcome:** Absence of deep vein thrombosis

**USES:** Unstable angina/non-Q-wave MI; prevention/treatment of deep vein thrombosis in abdominal surgery, hip replacement patients or those with restricted mobility during acute illness; pulmonary embolism

**Unlabeled uses:** Antiphospholipid antibody, arterial thromboembolism (after heart valve surgery), cerebral thromboembolism, acute MI

## CONTRAINDICATIONS

Hypersensitivity to this product, heparin, pork products; active major bleeding, hemophilia, leukemia with bleeding, thrombocytopenic purpura, cerebrovascular hemorrhage, cerebral aneurysm, those undergoing regional anesthesia for unstable angina, non–Q-wave MI, dalteparin-induced thrombocytopenia

**Precautions:** Hypersensitivity to benzyl alcohol, pregnancy, recent childbirth, breastfeeding, child, geriatric, hepatic disease, severe renal/cardiac disease, blood dyscrasias, bacterial endocarditis, acute nephritis, peptic ulcer disease, pericarditis, pericardial effusion, recent lumbar puncture, vasculitis, other diseases where bleeding is possible, uncontrolled hypertension; recent brain, spine, eye surgery; congenital or acquired disorders, hemorrhagic stroke, history of HIT

**BLACK BOX WARNING:** Epidural/spinal anesthesia, lumbar puncture

## DOSAGE AND ROUTES

### Deep vein thrombosis/pulmonary embolism

**Adult:** SUBCUT 200 international units/kg/day during 1st month (max single dose 18,000 international units), then 150 IU/kg/day in month 2-6 (max single dose 18,000 international units), use prefilled syringe that is closest to calculated dose; if platelets are 50,000-100,000/mm$^3$ reduce dose by 2500 international units until platelets ≥100,000/mm$^3$; if platelets <50,000/mm$^3$ discontinue until >50,000/mm$^3$

### Hip replacement surgery/DVT prophylaxis

**Adult:** SUBCUT 2500 international units 2 hr before surgery and 2nd dose in the evening the day of surgery (4-8 hr postop), then 5000 international units SUBCUT 1st postop day and daily 5-10 days

### Unstable angina/non-Q-wave MI

**Adult:** SUBCUT 120 international units/kg q12hr × 5-8 days; max 10,000 international units q12hr × 5-8 days with concurrent aspirin, continue until stable

### Deep vein thrombosis, prophylaxis for abdominal surgery

**Adult:** SUBCUT 2500 international units 1-2 hr prior to abdominal surgery and repeat daily × 5-10 days; in high-risk patients >3400 international units should be used

### Renal dose

**Adult:** SUBCUT cancer patient with CCr <30 ml/min, monitor and adjust based on anti-factor Xa

**Available forms:** Prefilled syringes, 2500, 5000 international units/0.2 ml; 7500 international units/0.3 ml, 10,000, 12,500, 15,000, 18,000 international units/ml

### Implementation

**SUBCUT route**

- **Cannot be used interchangeably unit for unit with unfractionated heparin or other LMWHs**
- Do not give IM or **IV** product route; approved in SUBCUT only; do not mix with other inj or sol
- Give by SUBCUT only; have patient sit or lie down; SUBCUT inj may be 2 in from umbilicus in a U-shape, upper outer side of thigh, around navel, or upper outer quadrangle of the buttocks; rotate inj sites
- Change inj site daily, use at same time of day

## ADVERSE EFFECTS

**CNS:** Intracranial bleeding
**HEMA:** Thrombocytopenia
**INTEG:** Alopecia, pruritus, superficial wound infection, skin necrosis, injection site reaction
**SYST:** Hypersensitivity, hemorrhage, anaphylaxis possible, hematoma

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 87% |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Kidney |
| **Half-life** | 3-5 hr elimination |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Aspirin: increased bleeding risk

### Drug classifications

Anticoagulants, NSAIDs, platelet inhibitors, some cephalosporins, salicylates, thrombolytics: increased risk of bleeding

### Drug/herb

Angelica, capsicum, chamomile, dandelion, danshen, feverfew, garlic, ginger, ginkgo, horse chestnut: increased bleeding risk

### Drug/lab test

Increase: AST/ALT
Decrease: Platelets

## NURSING CONSIDERATIONS

### Assessment

- Assess for bleeding (Hct, occult blood in stools) during treatment since bleeding can occur
- Assess for bleeding gums, petechiae, ecchymosis, black tarry stools, hematuria, epistaxis, decrease in Hct, B/P; may indicate bleeding, possible hemorrhage; notify prescriber immediately; product should be discontinued
- **Assess for hypersensitivity:** fever, skin rash, urticaria; notify prescriber immediately
- Assess for needed dosage change q1-2wk; dosage may need to be decreased if bleeding occurs

**BLACK BOX WARNING:** Epidural/**spinal** anesthesia: Assess for neurologic impairment frequently when neuraxial anesthesia has been used, spinal/epidural hematomas can occur, with paralysis; numbness in lower extremities, bowel or bladder changes, back pain, notify prescriber immediately, those at greater risk are those taking products causing increased bleeding risk

- **Pregnancy/breastfeeding:** No well-controlled studies, use only if clearly needed, do not use benzyl alcohol product in pregnancy, cautious use in breastfeeding

### Patient/family education

- Advise patient to avoid OTC preparations that contain aspirin, other anticoagulants; serious product interactions may occur
- Advise patient to use soft-bristle toothbrush to avoid bleeding gums, avoid contact sports, use electric razor, avoid IM inj
- **Bleeding; Instruct patient to report any signs of bleeding:** gums, under skin, urine, stools; unusual bruising

### Evaluation

**Positive therapeutic outcome**

- Absence of deep vein thrombosis

## TREATMENT OF OVERDOSE:
Protamine sulfate 1% given **IV**; 1 mg protamine/100 anti-Xa international units of dalteparin given

**⚠ HIGH ALERT**

# dantrolene (Rx)
(dan′troe-leen)
**Dantrium, Revonto, Ryanodex**
*Func. class.:* Skeletal muscle relaxant, direct acting
*Chem. class.:* Hydantoin

**Do not confuse:** Dantrium/danazol

## ACTION:
Interferes with intracellular release from the sarcoplasmic reticulum of calcium necessary to initiate contraction; slows catabolism in malignant hyperthermia

**Therapeutic outcome:** Decreased muscle spasticity; absence of malignant hyperthermia

## USES:
Spasticity in multiple sclerosis, stroke, spinal cord injury, cerebral palsy, prevention and treatment of malignant hyperthermia

**Unlabeled uses:** Neuroleptic malignant syndrome

## CONTRAINDICATIONS
Hypersensitivity, hepatic disease, hepatitis

**Precautions:** Pregnancy, breastfeeding, geriatric, peptic ulcer disease, renal/cardiac/hepatic, stroke, seizure disorder, diabetes mellitus, ALS, COPD, MS, mannitol/gelatin hypersensitivity, labor, lactase deficiency, extravasation

**BLACK BOX WARNING:** Hepatotoxicity

## DOSAGE AND ROUTES
### Spasticity
**Adult:** PO 25 mg/day; may increase to 25-100 mg bid-qid, max 400 mg/day, may be increased q7days as needed
**Child:** PO 0.5 mg/kg/day given in divided doses bid; may be increased q7days as needed; max 400 mg daily

### Malignant hyperthermia
**Adult and child:** **IV** 1 mg/kg; may repeat to total dose of 10 mg/kg; PO 4-8 mg/kg/day in 4 divided doses × 1-3 days to prevent further hyperthermia; postcrisis follow-up 4-8 mg/kg/day for 1-3 days

### Prevention of malignant hyperthermia
**Adult and child:** PO 4-8 mg/kg/day in 3-4 divided doses × 1-2 days before procedures; give last dose 4 hr preoperatively; **IV** 2.5 mg/kg prior to anesthesia

### Neuroleptic malignant syndrome (unlabeled)
**Adult:** PO 100-300 mg/day in divided doses, **IV** 1.25-1.5 mg/kg

**Available forms:** Caps 25, 50, 100 mg; powder for inj 20 mg/vial, 250 mg/vial

### Implementation
**PO route**
- Do not crush or chew caps; caps may be opened and mixed with juice and swallowed; drink immediately after mixing
- Give with meals for GI symptoms
- Store in airtight container at room temperature

**IV route**
- Administer **IV** after diluting 20 mg/60 ml sterile water for inj without bacteriostatic agent (333 mcg/ml); shake until clear; give by rapid **IV** push through Y-tube or 3-way stopcock; follow by prescribed doses immediately; may also give by intermittent inf over 1 hr before anesthesia; assess site for extravasation, phlebitis
- Protect diluted sol from light; use reconstituted sol within 6 hr
- Considered incompatible in sol or syringe, compatibility unknown

## ADVERSE EFFECTS
**CNS:** *Dizziness, weakness, fatigue, drowsiness,* headache, disorientation, insomnia, paresthesias, tremors, seizures
**CV:** Hypotension, chest pain, palpitations, tachycardia
**EENT:** Nasal congestion, blurred vision, mydriasis, excessive lacrimation
**GI:** Hepatic injury, *nausea,* constipation, vomiting, increased AST and alkaline phosphatase, abdominal pain, dry mouth, anorexia, hepatitis, dyspepsia
**GU:** Urinary frequency, nocturia, impotence, crystalluria, hepatitis
**HEMA:** Eosinophilia, aplastic anemia, leukopenia, thrombocytopenia/lymphoma
**INTEG:** Rash, pruritus, photosensitivity, extravasation (tissue necrosis), phlebitis
**RESP:** Pleural effusion, pulmonary edema

### Pharmacokinetics
| | |
|---|---|
| **Absorption** | PO (30%-35%), poor |
| **Distribution** | Unknown |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidney |
| **Half-life** | 9 hr |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | Unknown | Immediate |
| **Peak** | 5 hr | 5 hr |
| **Duration** | Dose related | Dose related |

## INTERACTIONS

• Considered incompatible in sol or syringe; compatibility unknown

### Individual drugs

Alcohol: increased CNS depression
Verapamil: increased dysrhythmias

### Drug classifications

Antidepressants (tricyclic), antihistamines, barbiturates, opiates, sedative/hypnotics: increased CNS depression, traMADol
Estrogens, hepatotoxic agents: increased hepatotoxicity

## NURSING CONSIDERATIONS

### Assessment

• Monitor I&O ratio; check for urinary retention, frequency, hesitancy, especially geriatric
• **Seizures:** Monitor ECG in epileptic patients; poor seizure control has occurred with patients taking this product; assess for increased seizure activity in epilepsy patient

**BLACK BOX WARNING: Active hepatic disease:** Monitor hepatic function by frequent determination of AST, ALT, bilirubin, alkaline phosphatase, GGTP; renal function studies; CBC; use lowest dose possible; check for jaundice, dark urine, diarrhea, weakness; product should be discontinued, occurs with oral form

• **Assess for allergic reactions:** rash, fever, respiratory distress
• Monitor for severe weakness, numbness in extremities; prescriber should be notified, product discontinued
• Assess for CNS depression: dizziness, drowsiness, psychiatric symptoms
• **Pregnancy/breastfeeding:** No well-controlled studies, avoid use in pregnancy, breastfeeding

### Patient/family education

• Caution patient not to discontinue product quickly, hallucinations, spasticity, tachycardia will occur; product should be tapered over 1-2 wk; notify prescriber of abdominal pain, jaundiced sclera, clay-colored stools, change in color of urine, rash, itching
• Caution patient not to take with alcohol, other CNS depressants; severe CNS depression can occur; avoid using OTC medication (cough preparations, antihistamines, alcohol, other CNS depressants), unless directed by prescriber, to take with meals
• Tell patient that if improvement does not occur within 6 wk, prescriber may discontinue
• Caution patient to avoid hazardous activities if drowsiness, dizziness, blurred vision occurs; wait several days to identify patient response to medication
• Advise patient to report severe weakness, seizures, signs of liver insufficiency
• Teach patient to use sunscreen, protective clothing for photosensitivity
• Instruct patient to take medication as prescribed; do not double doses; take missed dose within 1 hr of scheduled time
• **Malignant hyperthermia:** These patients should use a medical ID stating condition, products used

### Evaluation

**Positive therapeutic outcome**
• Decreased pain, spasticity
• Absence or decreased symptoms of malignant hyperthermia

## dapagliflozin

(dap′a-gli-floe′zin)
**Farxiga**
*Func. class.:* Oral antidiabetic
*Chem. class.:* SGLT-2 inhibitor (sodium-glucose cotransporter 2 inhibitor)

**Do not confuse:** Farxiga/Fetzima

**ACTION:** Blocks reabsorption of glucose by the kidneys, increases glucose excretion, lowers blood glucose concentrations

**Therapeutic outcome:** Improved signs/symptoms of diabetes mellitus (decreased polyuria, polydipsia, polyphagia; clear sensorium, absence of dizziness, stable gait); HbA1c WNL

**USES:** Type 2 diabetes mellitus, with diet and exercise

## CONTRAINDICATIONS

Dialysis, renal failure, hypersensitivity, breastfeeding, diabetic ketoacidosis

**Precautions:** Pregnancy, children, renal/hepatic disease, hypothyroidism, hyperglycemia, hypotension, bladder cancer, hypercholesterolemia, pituitary insufficiency, type 1 diabetes mellitus, malnutrition, fever, dehydration, adrenal insufficiency, geriatrics, genital fungal infections, hypoglycemia

## DOSAGE AND ROUTES

**Adult: PO** 5 mg in AM; may increase to 10 mg/day if needed

### Renal dose

**Adult:** PO eGFR ≥60 ml/min/1.73m$^2$, no change; eGFR<60 ml/min, do not use

**Available forms:** Tabs 5, 10 mg

### Implementation

**PO route**

- Give once/day in AM without regard to food in AM
- Store at room temperature

## ADVERSE EFFECTS

**CNS:** Dizziness, fatigue

**GI:** Abdominal pain, pancreatitis, constipation, nausea

**GU:** Cystitis, candidiasis, urinary frequency, polydipsia, polyuria, increased serum creatinine, renal impairment/failure, infections

**META:** Hypercholesterolemia, lipidemia, hypoglycemia, hyperkalemia, hypomagnesemia, hypophosphatemia/hyperphosphatemia

**MISC:** Bone fractures, hypotension, dehydration, orthostatic hypotension, hypersensitivity, new bladder cancer; increased hematocrit

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 91% protein binding |
| **Metabolism** | Primarily metabolized by O-glucuronidation by UGT1A9; minor CYP3A4 |
| **Excretion** | Urine |
| **Half-life** | 12.9 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Less than 2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs:

Baclofen, cycloSPORINE, isoniazid, tacrolimus: decreased effect, hyperglycemia

Bortezomib, lithium: increased or decreased glycemic control

Gatifloxacin: do not use concurrently

### Drug classifications

Androgens, quinolones: increased or decreased glycemic control

ACE inhibitors, angiotensin II receptor antagonists, bile acid sequestrates, β-blockers, fibric acid derivatives, insulins, MAOIs, salicylates, sulfonylureas: increased hypoglycemia, adjust antidiabetics

Atypical antipsychotics, carbonic anhydrase inhibitors, corticosteroids, digestive enzymes, estrogen, intestinal absorbents, loop diuretics, oral contraceptives, phenothiazines, progestins, protease inhibitors, sympathomimetics, thiazide diuretics: decrease effect, hyperglycemia

### Drug/lab test

Decrease: eGFR

Increase: Hct, LDL

## NURSING CONSIDERATIONS

### Assessment

- Hypoglycemia when used with other agents (assess hunger, dizziness, tremors, anxiety, tachycardia, sweating, weakness), hyperglycemia when used with other agents; even though product does not cause hyperglycemia, if patient is on sulfonylureas or insulin, hypoglycemia may be additive; if hypoglycemia occurs, treat with dextrose, or, if severe, with IV glucagon; monitor HbA1C, lipid panel, blood glucose, BUN, creatinine, discontinue if renal function is reduced
- **Hypotension:** More frequent in those with poor renal function, monitor volume status, B/P, usually in those with eGFR <60 ml/min/1.73 m$^2$
- **Ketoacidosis:** Monitor for increased urine/serum ketone levels, may occur without increased glucose levels, may occur more frequently in those with reduced intake of food, fluids, or serious conditions
- **Pregnancy/breastfeeding:** Avoid use in pregnancy, do not breastfeed

### Patient/family education

- Teach patient the symptoms of hypoglycemia and hyperglycemia, what to do about each
- Instruct patient that medication must be taken as prescribed; explain consequences of discontinuing medication abruptly; that insulin may need to be used for stress, including trauma, fever, surgery
- Instruct patient to avoid OTC medications and herbal supplements unless approved by health care provider
- Instruct patient that diabetes is a lifelong illness; that the diet and exercise regimen must be followed; that this product is not a cure
- Instruct patient to carry emergency ID and glucose source
- Instruct patient that blood glucose monitoring is required to assess product effect and periodic lab tests
- Instruct patient that GI side effects may occur
- Instruct patient that there is a risk of renal impairment, dehydration, and new bladder cancer

• **Ketoacidosis:** Report immediately confusion, abdominal pain, fatigue, trouble breathing

### Evaluation

**Positive therapeutic outcome**

• Improved signs/symptoms of diabetes mellitus (decreased polyuria, polydipsia, polyphagia); clear sensorium, absence of dizziness, stable gait; HbA1c WNL within normal limits

## DAPTOmycin (Rx)

(dap'toe-mye-sin)

**Cubicin**

*Func. class.:* Antiinfective—miscellaneous

*Chem. class.:* Lipopeptides

**ACTION:** New class of antiinfective; binds to the bacterial membrane and results in a rapid depolarization of the membrane potential, leading to inhibition of DNA, RNA, and protein synthesis

**Therapeutic outcome:** Absence of infections

**USES:** Complicated skin, skin structure infections caused by *Staphylococcus aureus,* (MRSA, MSSA) including methicillin-resistant strains, *Streptococcus pyogenes, S. agalactiae, S. dysgalactiae* (vancomycin-susceptible strains only), *Streptococcus pyogenes* (group A beta hemolytic), *Staphylococcus aureus, Staphylococcus epidermidis,* bone, joint infection, infectious arthritis, orthopedic device-related infection, osteomyelitis

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, geriatrics, GI/renal disease, myopathy, ulcerative/pseudomembranous colitis, rhabdomyolysis, eosinophilic pneumonia

## DOSAGE AND ROUTES

**Complicated skin or skin structure infection (SSRI) caused by susceptible strains of *S. aureus* (including MRSA), *Streptococcus, Pyogenes, S. agalactiae, S. disgalactiae, Enterococcus faecalis* (vancomycin-susceptible strains only)**

**Adult: IV** INF 4-6 mg/kg over ½ hr diluted in 0.9% NaCl, give q24hr × 7-14 days

**Adolescent/child/infant ≥5 mo (unlabeled): IV** 4-6 mg/kg/day

***Staphylococcus aureus* bacteremia, including right-sided infective endocarditis**

**Adult: IV INF** 6 mg/kg/day × 2-6 wk, up to 8-10 mg/kg/day, treatment failures should use another agent

### Renal dose

**Adult:** IV CCr <30 ml/min; hemodialysis, CAPD 4 mg/kg q48hr, 6 mg/kg q48hr (bacteremia)

**Available forms:** Lyophilized powder for inj 500 mg

### Implementation

• Obtain culture and sensitivity, can begin treatment before results

**Intermittent IV infusion route**

• Give after reconstitution with 10 ml 0.9% NaCl (500 mg/10 ml), further dilution is needed with 0.9% NaCl; infuse over ½ hr

**Direct IV route**

• Give reconstituted sol (50 mg/ml) by direct **IV** inj over 2 min

• Refrigerate vials, for single use only, discard unused portion; prepared solutions are stable for 12 hr at room temperature or 48 hr refrigerated

**Y-site compatibilities:** Alfentanil, amifostine, amikacin, aminocaproic acid, aminophylline, amiodarone, amphotericin B liposome, ampicillin, ampicillin-sulbactam, argatroban, arsenic trioxide, atenolol, atracurium, azithromycin, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, busulfan, butorphanol, calcium chloride/gluconate, CARBOplatin, carmustine, caspofungin, ceFAZolin, cefepime, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, cyclophosphamide, cycloSPORINE, dacarbazine, DACTINomycin, DAUNOrubicin, dexamethasone, dexmedetomidine, dexrazoxane, diazePAM, digoxin, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doripenem, doxacurium, DOXOrubicin, DOXOrubicin liposomal, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, foscarnet, fosphenytoin, furosemide, ganciclovir, gentamicin, glycopyrrolate, granisetron, haloperidol, heparin, hydrALAZINE, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, inamrinone, insulin (regular), irinotecan, isoproterenol, ketorolac, labetalol, lepirudin, leucovorin, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, meropenem, mesna, metaraminol, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, midazolam, milrinone, mitoXANtrone, mivacurium, morphine, moxifloxacin, mycophenolate mofetil, nafcillin, nalbuphine,

naloxone, niCARdipine, nitroprusside, norepinephrine, octreotide, ondansetron, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, PEMEtrexed, pentamidine, PHENobarbital, phenylephrine, piperacillin-tazobactam, polymyxin B, potassium acetate/chloride/phosphates, procainamide, prochlorperazine, promethazine, propranolol, quinupristin-dalfopristin, raNITIdine, rocuronium, sodium acetate/bicarbonate/citrate/phosphates, succinylcholine, sulfamethoxazole-trimethoprim, tacrolimus, teniposide, theophylline, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, topotecan, trimethobenzamide, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

**Solution compatibilities:** 0.9% NaCl, LR

## ADVERSE EFFECTS

**CNS:** Headache, insomnia, dizziness, confusion, anxiety, fatigue, fever
**CV:** Hypo/hypertension, heart failure, chest pain
**GI:** Nausea, constipation, diarrhea, vomiting, dyspepsia, pseudomembranous colitis, abdominal pain, stomatitis, xerostomia, anorexia
**GU:** Nephrotoxicity: increased BUN
**HEMA:** Leukocytosis, anemia, thrombocytopenia
**INTEG:** Rash, pruritus
**META:** Electrolyte imbalances
**MISC:** Fungal infections, UTI, anemia, hypoglycemia
**MS:** Muscle pain or weakness, arthralgia, pain, rhabdomyolysis, myopathy
**RESP:** Cough, eosinophilic pneumonia, dyspnea
**SYST:** Anaphylaxis, DRESS, Stevens-Johnson syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 92% |
| **Metabolism** | Unknown |
| **Excretion** | Breast milk |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Drug classifications

Individual drugs: Warfarin, monitor PT, INR, or discontinue, may alter anticoagulant levels
Increase: DAPTOmycin action-tobramycin
Increase: tobramycin levels
HMG-CoA reductase inhibitors: myopathy

### Drug/lab test

Increased: CPK, AST, ALT, BUN, creatinine, albumin, LDH
Increased/decreased: glucose
Decreased: alk phos, magnesium, phosphate, bicarbonate

## NURSING CONSIDERATIONS

### Assessment

- Assess signs of infection, C&S, product may be given as soon as culture is taken
- **Rhabdomyolysis:** check for myopathy CPK >1000 U/L (5×ULN), discontinue product, muscle pain, weakness
- **Nephrotoxicity:** Monitor any patient with compromised renal system: BUN, creatinine; toxicity may occur
- **Bowel function:** Assess for diarrhea, fever, abdominal pain; report to prescriber; Pseudomembranous colitis may occur
- **Monitor I&O ratio:** report hematuria, oliguria; nephrotoxicity may occur
- **Eosinophilic pneumonia:** Assess for dyspnea, fever, cough, shortness of breath, if left untreated can lead to respiratory failure and death
- Monitor blood tests: CBC
- Monitor C&S, product may be given as soon as culture is taken
- Monitor B/P during administration; hypo/hypertension may occur
- Identify allergies before treatment, reaction of each medication
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, avoid use in pregnancy or breastfeeding, lack of controlled studies
- Teach patient may cause dizziness, to avoid driving, hazardous activities until response is known

### Patient/family education

- Teach all aspects of product therapy
- Advise patient to report sore throat, fever, fatigue; could indicate superinfection; shortness of breath; diarrhea; muscle weakness, pain
- Instruct patient to avoid breastfeeding, and pregnancy

### Evaluation

#### Positive therapeutic outcome

- Negative culture, resolution of infection

**⚠ HIGH ALERT**

## darbepoetin (Rx)

(dar'bee-poh'-eh-tin)

**Aranesp**

*Func. class.:* Hematopoietic agent

*Chem. class.:* Recombinant human erythropoietin

**ACTION:** Stimulates erythropoiesis by the same mechanism as endogenous erythropoietin; in response to hypoxia, erythropoietin is produced in the kidney and released into the bloodstream, where it interacts with progenitor stem cells to increase red cell production

**Therapeutic outcome:** Decreased anemia with increased RBCs

**USES:** Anemia associated with chronic renal failure in patients on and not on dialysis and anemic in nonmyeloid malignancies receiving coadministered chemotherapy

## CONTRAINDICATIONS

Hypersensitivity to hamster proteins, human albumin, polysorbate 80; uncontrolled hypertension, red cell aplasia

**Precautions:** Pregnancy, breastfeeding, children, seizure disorder, porphyria, hypertension, sickle cell disease, vit $B_{12}$, folate deficiency, chronic renal failure, dialysis, latex hypersensitivity, CABG, angina, anemia

**BLACK BOX WARNING:** Hgb >11 g/dl, neoplastic disease, MI, stroke, thrombolic disease

## DOSAGE AND ROUTES

### Correction of anemia in chronic renal failure

**Adult:** SUBCUT/**IV** 0.45 mcg/kg as a single inj, titrate max target Hgb of 11 g/dl

### Chemotherapy treatment

**Adult:** SUBCUT 2.5 mcg/kg/wk or 500 mcg q3wk

### Epoetin alfa to darbepoetin conversion

**Adult:** SUBCUT/**IV** (epoetin alfa <2500 units/wk) 6.25 mcg/wk; (epoetin alfa 2500-4999 units/wk) 12.5 mcg/wk; (epoetin alfa 5000-10,999 units/wk) 25 mcg/wk; (epoetin alfa 11,000-17,999 units/wk) 40 mcg/wk; (epoetin alfa 18,000-33,999 units/wk) 60 mcg/wk; (epoetin alfa 34,000-89,999 units/wk) 100 mcg/wk; (epoetin alfa >90,000 units/wk) 200 mcg/wk

**Available forms:** Sol for inj 25, 40, 60, 100, 150, 200, 300, 500 mcg/ml

### Implementation

- Transfusions may still be required for anemia, use iron supplements with this product

**IV/SUBCUT route**

- Do not shake, do not dilute, do not mix with other products or solutions
- Check for discoloration, particulate matter; do not use if present; discard unused portion; do not pool unused portion
- Store refrigerated, do not freeze, protect from light

## ADVERSE EFFECTS

**CNS:** Seizures, sweating, headache, dizziness, stroke

**CV:** *Hypo/hypertension,* cardiac arrest, *angina pectoris,* thrombosis, HF, acute MI, dysrhythmias, chest pain, transient ischemic attacks, edema

**GI:** *Diarrhea, vomiting, nausea, abdominal pain, constipation*

**HEMA:** Red cell aplasia

**MISC:** *Infection, fatigue, fever,* death, *fluid overload,* vascular access hemorrhage, dehydration, sepsis

**MS:** *Bone pain, myalgia, limb pain, back pain*

**RESP:** *Upper respiratory infection, dyspnea, cough, bronchitis,* pulmonary embolism

**SYST:** Allergic reactions, anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Slow, rate-limiting (SUBCUT) |
| **Distribution** | Vascular space |
| **Metabolism** | Metabolized in body (**IV**), extent unknown |
| **Excretion** | Unknown |
| **Half-life** | 49 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Onset of increased reticulocyte count 1-6 wk |
| **Peak** | 34 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

- Do not use epoetin alfa with this product

### Drug classifications

Androgens: increased darbepoetin alfa effect

### Drug/lab test

Increased: WBC, platelets, Hgb
Decreased: bleeding time

## NURSING CONSIDERATIONS

### Assessment

• **Assess for serious allergic reactions:** rash, urticaria; if anaphylaxis occurs, stop product, administer emergency treatment (rare)

**BLACK BOX WARNING:** Hemoglobin >11 g/dl: monitor Hgb before and weekly × 4 wk or after change in dose and then often after target range has been reached, a rise >1 g/dl over 2 wk may increase risks, reduce dose

**BLACK BOX WARNING:** Assess blood studies: ferritin, transferrin monthly; transferrin sat ≥20%, ferritin ≥100 ng/ml; Hgb 2 ×/wk until stabilized in target range (30%-33%), then at regular intervals; those with endogenous erythropoietin levels of <500 units/L respond to this agent, if there is lack of response, obtain folic acid, iron, $B_{12}$ levels

**BLACK BOX WARNING:** Assess renal studies: urinalysis, protein, blood, BUN, creatinine, those with renal dysfunction may be at greater risk of death, keep Hgb <10 g/dl in chronic kidney disease

• Assess B/P, Hct; check for rising B/P as Hct rises; antihypertensives may be needed

**BLACK BOX WARNING:** Assess CV status: hypertension may occur rapidly, leading to hypertensive encephalopathy; Hgb >11 g/dl may lead to death

• Assess I&O ratio; report drop in output to <50 ml/hr

• Assess for **seizures** if Hgb is increased within 2 wk by 4 points, institute seizure precautions

**BLACK BOX WARNING:** Assess CNS symptoms: cold sensation, sweating, pain in long bones

**BLACK BOX WARNING:** Assess **dialysis patients** for thrill, bruit of shunts; monitor for circulation impairment

**BLACK BOX WARNING:** **Neoplastic disease:** breast, non-small cell lung, head and neck, lymphoid or cervical cancers, increased tumor progression, use lowest dose to avoid RBC transfusion. Facility must be enrolled in the ESA APPRISE oncology program (866-284-8089) to use this product in cancer treatment

• **Pregnancy/breastfeeding:** Avoid use in pregnancy/breastfeeding, those who become pregnant should register with Amgen's Pregnancy Surveillance program 800-772-6436

### Patient/family education

• Caution patient to avoid driving or hazardous activity during beginning of treatment

• Advise patient to monitor B/P, max Hgb 11 g/dl

• Advise patient to take iron supplements, vit $B_{12}$, folic acid as directed

**BLACK BOX WARNING:** Advise patient to report chest pain, shortness of breath, swelling/pain in legs, confusion, inability to speak to prescriber, to comply with treatment regimen

• Teach patient that menses may return, use contraception

• Teach home administration and review information for patients and caregivers if home administration is deemed appropriate

**BLACK BOX WARNING:** Seizures: discuss injury prevention in those that are prone to seizures

### Evaluation

**Positive therapeutic outcome**

• Increased reticulocyte count, Hgb/Hct

• Increased appetite

• Enhanced sense of well-being

**TREATMENT OF OVERDOSE:** If polycythemia occurs, discontinue product temporarily; perform phlebotomy if clinically indicated

## darifenacin

(da-ree-fen'ah-sin)

**Enablex**

*Func. class.:* Antispasmodic/GU anticholinergic

**Do not confuse:** Enablex/Effexor XR

**ACTION:** Bladder smooth muscle relaxation by decreasing the action of muscarinic receptors, thereby relieving overactive bladder

**Therapeutic outcome:** Decreasing urgency, frequency of urination

**USES:** Urge incontinence, frequency, urgency in overactive bladder

**CONTRAINDICATIONS**

Hypersensitivity, urinary retention, narrow-angle glaucoma (uncontrolled)

**Precautions:** Severe hepatic disease (Child-Pugh), GI/GU obstruction, controlled narrow-angle glaucoma, ulcerative colitis, myasthenia gravis, moderate hepatic disease (Child-Pugh B), elderly patients

## DOSAGE AND ROUTES

**Adult:** PO 7.5 mg/day, initially, may increase to 15 mg/day after 14 days if needed

### With taking a potent CYP3A4 inhibitor

**Adult:** PO Max 7.5 mg/day

### Hepatic dose

**Adult:** PO (Child-Pugh B) max 7.5 mg, do not use in severe hepatic disease

**Available forms:** Tabs, EXT REL 7.5, 15 mg

### Implementation

**PO route**

- Give without regard to meals
- Do not crush, break, chew EXT REL tabs
- Store at room temperature

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, confusion
**EENT:** Blurred vision, drying eyes, sinusitis, rhinitis
**GI:** Constipation, dry mouth, abdominal pain, nausea, vomiting, dyspepsia
**GU:** UTI, urine retention, vaginitis
**INTEG:** Rash, pruritus, skin drying
**MISC:** Bronchitis, flulike symptoms, angioedema
**MS:** Back pain

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Excretion** | Unknown |
| **Metabolism** | Extensively metabolized by CYP2D, less metabolism in poor metabolizers; some metabolism by CYP3A4 |
| **Half-life** | 12-19 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 7 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Anticholinergics: increased anticholinergic effect
CYP3A4 and CYP2D6 inhibitors: (ketoconazole, itraconazole, ritonavir) increased darifenacin levels
Drugs metabolized by CYP2D6 (fluoxetine, tricyclics): increased levels of these products

## NURSING CONSIDERATIONS

### Assessment

- **Urinary function:** Assess for urgency, frequency, retention in bladder outflow obstruction
- Bowel pattern: Assess for constipation, abdominal pain

### Patient/family education

- **Angioedema:** Teach patient to report facial swelling or large tongue
- Instruct patient to advise prescriber if pregnancy is planned or suspected; avoid breastfeeding
- Teach patient about anticholinergic symptoms (dry mouth, constipation, dry eyes, heat prostration), not to become overheated, not to use other products unless approved by prescriber
- Teach patient to avoid hazardous activities until reaction is known, dizziness, blurred vision may occur

### Evaluation

**Positive therapeutic outcome**

- Decreasing urgency, frequency of urination

**⚠ HIGH ALERT**

# DAUNOrubicin (Rx)

(daw-noe-roo'bi-sin)
**Cerubidine**

# DAUNOrubicin citrate liposome (Rx)

**DaunoXome**

*Func. class.:* Antineoplastic, antibiotic
*Chem. class.:* Anthracycline glycoside

**Do not confuse:** DAUNOrubicin/DOXOrubicin

**ACTION:** Inhibits DNA synthesis, primarily; derived from *Streptomyces coeruleorubidus;* replication is decreased by binding to DNA, binds DNA causing confirmational changes; a vesicant

**Therapeutic outcome:** Prevention of rapidly growing malignant cells; immunosuppression

**USES:** Acute lymphocytic leukemia (ALL), acute myelogenous leukemia (AML); liposomal Kaposi's sarcoma

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity, systemic infections, cardiac disease, bone marrow depression

**BLACK BOX WARNING:** IM/Subcut use

**Precautions:** Renal/hepatic disease, gout, tumor lysis syndrome, MI, infection, thrombocytopenia

**BLACK BOX WARNING:** Bone marrow suppression, cardiac disease, extravasation, renal failure, hepatic disease, requires a specialized care setting and an experienced clinician

## DOSAGE AND ROUTES

Use decreased dose for those >60 yr

### >> DAUNOrubicin

#### In combination

**Adult:** **IV** 45-60 mg/m$^2$/day × 3 days, then 2 days of subsequent courses in combination, max 400-600 mg/m$^2$ total cumulative dose

**Child:** **IV** 25-60 mg/m$^2$ depending on cycle (AML); ≤2 yr or <0.5 m$^2$: 1 mg/kg on day 1 weekly in combination with vinCRIStine and predniSONE, base dose on body weight, not surface area (ALL); >2 yr or 0.5 m$^2$: 25 mg/m$^2$ day 1 q wk in combination with vinCRIStine and predniSONE (ALL)

### >> DAUNOrubicin citrate liposome

**Adult:** **IV** 40 mg/m$^2$ q2wk (Kaposi's sarcoma); **IV** 100-140 mg/m$^2$ q3wk (non-Hodgkin's lymphoma, unlabeled; IV escalating doses of 75, 100, 125, 135, 150 mg/m$^2$/day × 3 days (AML, unlabeled)

#### Renal dose

**Adult:** IV serum Cr >3 mg/dl reduce dose by 50%

#### Hepatic dose

**Adult:** IV serum bilirubin 1.2-3 mg/dl reduce dose by 50%; bilirubin >3 mg/dl reduce dose by 75%; bilirubin >5 mg/dl omit dose

**Available forms:** Inj 20 mg powder/vial, sol for inj 5 mg/ml (DaunoXome); liposome: dispersion for inj 2 mg/ml

#### Implementation

- Avoid contact with skin; very irritating; wash completely to remove
- Give fluids **IV** or PO before chemotherapy to hydrate patient; give antiemetic 30-60 min before giving product to prevent vomiting, and prn; antibiotics for prophylaxis of infection
- Provide liquid diet: carbonated beverages; gelatin may be added if patient is not nauseated or vomiting

**BLACK BOX WARNING:** To be used in a care setting with emergency equipment available; to be used by a clinician knowledgeable in cytotoxic therapy, do not give by IM/SUBCUT route

- Help patient rinse mouth tid-qid with water, club soda, brush teeth bid-qid with soft brush or cotton-tipped applicators for stomatitis, use unwaxed dental floss
- Product should be prepared by experienced personnel using proper precautions
- Do not give by IM/SUBCUT inj

### >> Cerubidine

**IV route**

- Give after diluting 20 mg/4 ml sterile water for inj (5 mg/ml); rotate; further dilute in 10-15 ml 0.9% NaCl; give over 3-5 min by direct **IV** through Y-tube or 3-way stopcock of inf of $D_5W$ or 0.9% NaCl, may use premix vial 5 mg/ml

**Intermittent IV infusion route**

- Dilute further in 50-100 ml 0.9% NaCl, LR, $D_5W$; give over 15 min (50 ml), 30 min (100 ml) for extravasation

**Y-site compatibilities:** Amifostine, anidulafungin, atenolol, bivalirudin, bleomycin, CARBOplatin, caspofungin, CISplatin, codeine, cyclophosphamide, cytarabine, DACTINomycin, DAPTOmycin, dexmedetomidine, etoposide, fenoldopam, filgrastim, gemcitabine, gemtuzumab, granisetron, melphalan, meperidine, methotrexate, nesiritide, octreotide, ondansetron, oxaliplatin, PACLitaxel, palonosetron, quinupristin-dalfopristin, riTUXimab, sodium acetate/bicarbonate, teniposide, thiotepa, tigecycline, trastuzumab, vinCRIStine, vinorelbine, voriconazole, zoledronic acid

**Y-site incompatibilities:** Fludarabine

**Solution compatibilities:** $D_{3.3}$/0.3% NaCl, $D_5W$, Normosol-R, Ringer's, 0.9% NaCl

### >> DaunoXome

**IV route**

- Dilute with $D_5W$ (1 mg/ml), give over 60 min, do not use in-line filter, reconstituted sol may be stored ≤6 hr refrigerated; do not admix

## ADVERSE EFFECTS

### >> DAUNOrubicin

**CNS:** Fever, chills

**CV:** HF, pericarditis, myocarditis, peripheral edema, fatal myocarditis, left ventricular failure, QT prolongation, ST-T wave changes, QRS voltage changes, tachycardia, SVT, PVCs

**GI:** *Nausea, vomiting, anorexia, mucositis,* hepatotoxicity

**GU:** Impotence, sterility, amenorrhea, gynecomastia

**HEMA:** Thrombocytopenia, leukopenia, anemia

**INTEG:** *Rash, extravasation,* dermatitis, reversible alopecia, cellulitis, thrombophlebitis at inj site
**MISC:** Anaphylaxis, tumor lysis syndrome, secondary malignancies

### >> DAUNOrubicin citrate liposome

**CNS:** Fatigue, headache, depression, insomnia, dizziness, malaise, neuropathy
**CV:** Chest pain, edema
**GI:** Abdominal pain, nausea, vomiting, *diarrhea,* constipation, stomatitis
**INTEG:** *Alopecia,* sweating, *pruritus*
**MISC:** *Allergic reactions, chest pain, fever,* edema, flulike symptoms
**MS:** *Rigors,* arthralgia, back pain
**RESP:** *Cough, dyspnea, rhinitis, sinusitis*

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Liver, extensively |
| **Excretion** | Biliary (40%-50%) |
| **Half-life** | 18½ hr, liposome 55½ hr |

#### Pharmacodynamics

Unknown

## INTERACTIONS

Arsenic trioxide, chloroquine, clarithromycin, dasatinib, dolasetron, droperidol, erythromycin, flecainide, halofantrine, haloperidol, levomethadyl, methadone, ondansetron, palonosetron, pentamide, propafenone, risperiDONE, sparfloxacin, vorinstat, ziprasidone: increase QT prolongation, torsades de pointes

### Individual drugs

Cyclophosphamide, radiation: increased toxicity

### Drug classifications

Antineoplastics: increased toxicity
Class IA/III antidysrhythmics, some phenothiazines, tricyclic antidepressants (high doses): increased QT prolongation, torsades de pointes
Live virus vaccines: decreased antibody reaction
NSAIDs, salicylates: increased risk of bleeding, anticoagulants, platelet inhibitors, thrombolytics
Hematopoietic progenitor cells: given within 24 hr: decreased DAUNOrubicin given within 24 hr

### Drug/lab test

Increased: uric acid

## NURSING CONSIDERATIONS

### Assessment

- Assess buccal cavity q8hr for dryness, sores or ulceration, white patches, pain, bleeding, dysphagia; obtain prescription for viscous lidocaine (Xylocaine)
- **Assess symptoms indicating severe allergic reaction:** rash, pruritus, urticaria, purpuric skin lesions, itching, flushing; product should be discontinued

**BLACK BOX WARNING: Cardiac toxicity:** assess chest x-ray, echocardiography, radionuclide angiography, MUGA, ECG; watch for ST-T wave changes, low QRS and T, QT prolongation possible, dysrhythmias (sinus tachycardia, heart block, PVCs); watch for HF (jugular vein distention, weight gain, edema, crackles), may occur after 2-6 mo of treatment, cumulative dose (400-550 mg/m$^2$), 450 mg/m$^2$ if used in combination with radiation, cyclophosphamide

**BLACK BOX WARNING:** Monitor CBC, **bone marrow suppression,** differential, platelet count weekly, leukocyte nadir within 2 wk after administration, recovery within 3 wk; do not administer if absolute granulocyte count is $<$750/mm$^3$ (liposome)

- Assess for increased uric acid levels, swelling, joint pain primarily in extremities; patient should be well hydrated to prevent urate deposits
- **Acute renal failure, uric acid nephropathy:** Monitor renal function tests: BUN, creatinine, serum uric acid, urine CCr baseline and before each dose; I&O ratio; report fall in urine output to $<$30 ml/hr, provide aggressive alkalinization of the urine as use of allopurinol can prevent urate nephropathy
- Monitor temp q4hr (may indicate beginning of infection)
- **Hepatotoxicity:** Monitor liver function tests baseline and before each dose (bilirubin, AST, ALT, LDH) as needed or monthly; note jaundice of skin or sclera, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea; hepatotoxicity can be severe
- Assess for bleeding: hematuria, stool guaiac, bruising or petechiae, mucosa or orifices q8hr; check for inflammation of mucosa, breaks in skin
- Identify effects of alopecia on body image; discuss feelings about body changes
- **Tumor lysis syndrome:** hyperkalemia, hyperphosphatemia, hyperuricemia, hypocalcemia

**BLACK BOX WARNING: Extravasation:** swelling, pain, decreased blood return, if extravasation occurs stop infusion, remove tubing, attempt to aspirate the drug prior to removing the needle, elevate area, treat with ice

### Patient/family education

- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding
- Teach patient to avoid use of products containing aspirin or ibuprofen, razors, commercial mouthwash, since bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools)
- Instruct patient to report signs of **anemia** (fatigue, headache, irritability, faintness, shortness of breath); signs of **infection;** bleeding, bruising, shortness of breath, swelling, change in heart rate; to avoid crowds, those with known infections
- Advise patient that hair may be lost during treatment; a wig or hairpiece may make patient feel better; new hair may be different in color, texture
- Caution patient not to have any vaccinations without the advice of the prescriber; serious reactions can occur
- Advise patient that contraception is needed during treatment and for 4 mo after the completion of therapy
- Advise patient to avoid alcohol, aspirin, NSAIDs
- Inform patient that urine and other body fluids may be red-orange for 48 hr
- Teach patient to avoid crowds, those with known infections

### Evaluation

**Positive therapeutic outcome**

- Prevention of rapid division of malignant cells

**⚠ HIGH ALERT**

## delavirdine (Rx)

(de-la-veer′deen)

**Rescriptor**

*Func. class.:* Antiretroviral

*Chem. class.:* Nonnucleoside reverse transcriptase inhibitor (NNRTI)

**ACTION:** Binds directly to reverse transcriptase and blocks RNA, DNA-dependent polymerase activities causing a disruption of the enzyme's site

**Therapeutic outcome:** Improvement of HIV-1 infection

**USES:** HIV-1 in combination with at least 2 other antiretrovirals

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, hepatic disease, exfoliative dermatitis, hepatitis, immune reconstitution syndrome, achlorhydria, antimicrobial resistance

## DOSAGE AND ROUTES

**Adult and child ≥16 yr:** PO 400 mg tid; max 1200 mg/day

**Available forms:** Tabs 100, 200 mg

### Implementation

- Add 4 tabs/3-4 oz of water, let stand, stir, swallow, rinse glass, swallow; use only 100 mg tabs for dispersion
- Do not give within 1 hr of antacids or didanosine
- Take in equal intervals around the clock
- Always use as combination therapy; this product is not recommended for initial treatment; due to inferior, virologic effect, it is no longer listed as part of any preferred regimens

## ADVERSE EFFECTS

**CNS:** Headache, fatigue, anxiety, insomnia, fever
**GI:** Diarrhea, anorexia, abdominal pain, nausea, vomiting, dyspepsia, hepatotoxicity
**GU:** Nephrotoxicity
**HEMA:** Neutropenia, leukopenia, thrombocytopenia, anemia, granulocytopenia
**INTEG:** Rash, pruritus
**MISC:** Cough
**MS:** Pain, myalgia, rhabdomyolysis
**SYST:** Stevens-Johnson syndrome, immune reconstitution syndrome (combination therapy)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well |
| **Distribution** | 98% protein bound |
| **Metabolism** | Liver, extensively by CYP3A4 |
| **Excretion** | Kidneys, feces |
| **Half-life** | 2-11 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1 hr |
| **Duration** | 8 hr |

## INTERACTIONS

### Individual drugs

ALPRAZolam, amprenavir, atorvastatin, clarithromycin, dapsone, felodipine, indinavir, lovastatin, midazolam, NIFEdipine, saquinavir, simvastatin: increased level of each specific product

ALPRAZolam, astemizole, cisapride, midazolam, pimozide, sildenafil, terfenadine, triazolam: life-threatening reactions; do not combine
Clarithromycin, quiNIDine, warfarin: increased level of both products
Didanosine: decreased delavirdine levels, decreased action of didanosine, $H_2$ blockers, PPIs
FLUoxetine, ketoconazole: increased level of delavirdine

### Drug classifications

Amphetamines, antidysrhythmics, benzodiazepines, calcium channel blockers, ergots, sedative/hypnotics, opiates: increased serious life-threatening adverse reaction
Antacids, anticonvulsants, protease inhibitors, rifamycins: decreased delavirdine levels
**Contraceptives (oral):** decreased action of oral contraceptives
CYP3A4, 2D6 inhibitors: increased levels
Ergots: increased levels of ergots

### Drug/herb

St. John's wort, avoid use: decreased delavirdine level

### Drug/lab test

Increase: ALT/AST, alkaline phosphatase, bilirubin, creatinine, CK, lipase, CGT, eosinophils, PT, PTT
Decrease: RBC, WBCs, platelets, granulocytes

## NURSING CONSIDERATIONS

### Assessment

- Assess CBC, blood chemistry, plasma HIV RNA, absolute $CD4^+$/$CD8^+$/cell counts/%, serum $\beta_2$ microglobulin, serum ICD+24 antigen levels
- Assess signs of infection, anemia
- Assess liver function tests: ALT, AST; renal studies
- Assess C&S before product therapy; product may be taken as soon as culture is taken; repeat C&S after treatment; determine the presence of other STDs
- Assess bowel pattern before, during treatment; if severe abdominal pain with bleeding occurs, product should be discontinued; monitor hydration
- Assess allergies before treatment, reaction to each medication; place allergies on chart
- Assess plasma delavirdine concentrations (trough 10 mcm)
- HIV: Obtain hepatitis B virus (HBV) screening to ensure proper treatment, if co-infected, a fully suppressive antiretroviral regimen with productions against both
- **Serious skin reactions: Stevens-Johnson syndrome;** any rash may occur within 1-3 wk of beginning treatment; if rash is not severe, manage with diphenhydrAMINE, hydrOXYzine, topical corticosteroids
- **Immune reconstitution syndrome:** When treated with combination therapy; development of opportunistic infections (Mycobacterium avium complex [MAC]), cytomegalovirus (CMV), Pneumocystis jiroveci pneumonia (PCP), or TB
- **Delavirdine toxicity:** severe nausea, vomiting, maculopapular rash
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, use in pregnancy only if benefits outweigh fetal risk, if pregnant; patient should register with the antiretroviral Pregnancy Registry 800-258-4263, not to breastfeed

### Patient/family education

- Advise patient to take as prescribed; if dose is missed, take as soon as remembered up to 1 hr before next dose; do not double dose, separate by 1 hr, do not take antacids concurrently
- Advise patient that product must be taken in equal intervals around the clock to maintain blood levels for duration of therapy
- Advise patient that tabs may be dissolved; drink right away (100 mg only), rinse cup with water, and drink that to get all medication
- Instruct patient to make sure health care provider knows of all the medications being taken
- Advise patient that if severe rash, mouth sores, swelling, aching muscles/joints, or eye redness occur, stop taking and notify health care provider
- Advise patient not to breastfeed if taking this product
- Teach patient that this product is not a cure, only controls symptoms

### Evaluation

#### Positive therapeutic outcome

- Increased $CD4^+$ cell count
- Decreased viral load
- Improvement in symptoms of HIV

## denosumab (Rx)

(den-oh'sue-mab)
**Prolia, Xgeva**
*Func. class.:* Bone resorption inhibitor
*Chem. class.:* Monoclonal antibody, bone resorption

**ACTION:** Neutralizes activity of receptor activator nuclear factor kappa-B ligand (RANKL) by binding to it and blocking its interaction with cell surface receptors, use of a RANKL inhibitor may reduce bone turnover and decrease tumor burden

**Therapeutic outcome:** Increased/maintained bone density

**USES:** Osteoporosis in postmenopausal women or men at high risk for fractures, who are receiving androgen deprivation therapy for prostate cancer, and women receiving aromatase inhibitor therapy for breast cancer; prevention of skeletal-related events in bone metastases from solid tumors; giant cell tumor of bone (Xgeva); increase bone mass

## CONTRAINDICATIONS

Hypersensitivity, hypocalcemia, pregnancy

**Precautions:** Anemia, breastfeeding, child/infant/neonate, coagulopathy, diabetes mellitus, dialysis, eczema, hypoparathyroidism, immunosuppression, latex hypersensitivity, malabsorption syndrome, neonates, neoplastic disease, pancreatitis, parathyroid disease, pregnancy, dental/renal/thyroid disease, TB, vitamin D deficiency

## DOSAGE AND ROUTES

### Postmenopausal osteoporosis (Prolia)

**Adult female:** SUBCUT 60 mg q6mo with 1000 mg calcium and 400 international units vitamin D, max 60 mg q6mo

### Bone metastases from solid tumors

**Adult:** SUBCUT 120 mg q4wk, max 120 mg q4wk; administer with calcium and vitamin D as necessary to prevent hypocalcemia

### Giant cell tumor of bone (Xgeva)

**Adult:** SUBCUT 120 mg on days 1, 8, 15, then 120 mg q4wk; use calcium, vitamin D as needed

**Available forms:** Solution for injection 60 mg/ml (Prolia); 120 mg/1.7 ml (Xgeva)

### Implementation

**SUBCUT route**

- Give acetaminophen before and for 72 hr after to decrease pain
- Do not use if particulate matter or discoloration is present; solution is clear and colorless to slightly yellow with small white/opalescent particles, remove from refrigerator and allow to warm to room temperature (15-30 min)
- **Use of prefilled syringe with needle safety guard:** Leave green guard in original position until after administration, remove and discard needle cap immediately before injection, give by SUBCUT injection in upper arm, thigh, or abdomen; after injection, point needle away from people and slide green guard over needle
- **Use of single-use vials:** Use 27G needle, give in upper arm/thigh, or abdomen, do not re-insert needle in vial, discard supplies as appropriate
- Avoid direct sunlight/heat, do not freeze, use within 14 days after removal from refrigerator, store unopened containers in refrigerator

## ADVERSE EFFECTS

**CNS:** Chills, fever, flushing, headache, vertigo, neuropathic pain
**CV:** Angina, atrial fibrillation
**GI:** Abdominal pain, constipation, *diarrhea,* flatulence, GERD, *vomiting, nausea*
**GU:** Cystitis, lactation suppression
**HEMA:** Anemia, neutropenia
**INTEG:** Atopic dermatitis, pruritus
**META:** Hypercholesterolemia, hypocalcemia, hypophosphatemia
**MS:** Back/bone pain, MS pain, myalgia, osteonecrosis of the jaw
**RESP:** Cough, *dyspnea*
**SYST:** Infection, secondary malignancy

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Bioavailability 62% |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 25.4 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Maximum serum concentration 3-21 days |
| **Duration** | Steady state 6 months |

## INTERACTIONS

### Drug classifications

Immunosuppressives (except cytarabine liposomal), corticosteroids: possible increased infection
Antineoplastics, corticosteroids: possible increased osteonecrosis of the jaw

### Drug/lab test

Increase: cholesterol

## NURSING CONSIDERATIONS

### Assessment

- **Assess for acute acute-phase reaction:** fever, myalgia, headache, flulike symptoms, for 72 hr after injection, usually resolves after 72 hr
- Monitor blood tests: serum calcium/creatinine/BUN/magnesium/phosphate; provide adequate calcium D, magnesium
- **Assess for hypocalcemia (may be fatal):** paresthesia, twitching, laryngospasm, Chvostek's/Trousseau's signs; preexisting hypocalcemia prior to treatment; patient with vitamin D deficiency may require higher doses of vitamin D

• **Assess for hypercalcemia:** nausea, vomiting, anorexia, weakness, thirst, constipation, dysrhythmias
• **Pregnancy/breastfeeding:** identify if pregnancy is planned or suspected, women who become pregnant should enroll in Amgen's Pregnancy Surveillance Program (800-772-6436), do not use in pregnancy, breastfeeding
• **Monitor dental status:** correct dental complications prior to product use, good oral hygiene should be maintained; if dental work is to be performed, antiinfectives should be given to prevent osteonecrosis of the jaw
• **Assess for infection:** Do not start treatment in those with active infections, infections should be resolved first

### Patient/family education

• Advise patient to report hypercalcemic relapse: nausea, vomiting, bone pain, thirst
• Teach patient to notify prescriber immediately of rash, infection, cramps, twitching
• Teach patient to continue with dietary recommendations including additional calcium 1000 mg/day and vitamin D ≥ 400 units (Prolia product labeling)
• **Pregnancy:** Advise patient not to use in pregnancy and breastfeeding, notify prescriber if pregnancy is planned or suspected, to use contraception during and for 5 mo after completion of therapy, males should use contraception if partner is pregnant
• Instruct patient to use acetaminophen prior to and for 72 hrs after injection to lessen bone pain
• Explain the purpose of this product and expected results
• Advise patient to avoid OTC, Rx, or herbs and supplements unless approved by prescriber
• Teach patient to use regular exercise, stop smoking, and avoid alcohol to maintain bone health
• Advise patient to inform all health care providers of product use, avoid dental procedures/surgery if possible, practice good oral hygiene
• Teach patient that lab tests and follow-up exams will be required

### Evaluation

#### Positive therapeutic outcome

• Increased/maintained bone density

## desipramine (Rx)

(dess-ip'ra-meen)
**Norpramin**
*Func. class.:* Antidepressant, tricyclic
*Chem. class.:* Dibenzazepine, secondary amine

**Do not confuse desipramine/** disopyramide

**ACTION:** Blocks reuptake of norepinephrine, serotonin into nerve endings, increasing action of norepinephrine, serotonin in nerve cells

**Therapeutic outcome:** Decreased depression

**USES:** Depression

**Unlabeled uses:** Chronic pain, ADHD, bulimia, diabetic neuropathy, panic disorder, social phobia

## CONTRAINDICATIONS

Hypersensitivity to tricyclics, carBAMazepine; closed-angle glaucoma, acute MI, MAOIs

**Precautions:** Pregnancy, breastfeeding, geriatric, severe depression, increased intraocular pressure, seizure disorder, CV disease, urinary retention, cardiac dysrhythmias, cardiac conduction disturbances, family history of sudden death, prostatic hypertrophy, thyroid disease

**BLACK BOX WARNING:** Suicidal patients, children <18 yr

## DOSAGE AND ROUTES

### Major depression

**Adult:** PO 50-75 mg/day in 1-4 divided doses; titrate by 25-50 mg qwk up to 300 mg/day in single or divided doses (inpatient), 200 mg/day (outpatient)
**Geriatric:** PO 25 mg/day at bedtime, titrate qwk; may increase to 150 mg/day
**Child >12 yr:** PO 25-50 mg/day in divided doses, max 150 mg/day
**Child 6-12 yr:** PO 1-3 mg/kg/day in divided doses, give >3 mg/kg/day with close medical monitoring; max 5 mg/kg/day

**Available forms:** Tabs 10, 25, 50, 75, 100, 150 mg

### Implementation

• Increase fluids, bulk in diet for constipation, especially in geriatric
• Take with food or milk for GI symptoms

• Crush if patient is unable to swallow medication whole, without regard to food
• Give dosage at bedtime if oversedation occurs during day; may take entire dose at bedtime; geriatric may not tolerate once a day dosing
• Store at room temperature
• Provide assistance with ambulation during beginning of therapy for drowsiness/dizziness
• Provide safety measures, primarily in the geriatric
• Check to see that PO medication is swallowed

## ADVERSE EFFECTS

**CNS:** *Dizziness, drowsiness,* confusion, headache, anxiety, tremors, stimulation, weakness, insomnia, nightmares, EPS (geriatric), increased psychiatric symptoms, paresthesia, suicidal ideation, impaired memory, seizures, serotonin syndrome
**CV:** *Orthostatic hypo/hypertension,* ECG changes, *tachycardia, palpitations*
**EENT:** *Blurred vision,* tinnitus, mydriasis, ophthalmoplegia
**ENDO:** SIADH
**GI:** *Diarrhea, dry mouth,* nausea, vomiting, paralytic ileus, increased appetite, cramps, epigastric distress, jaundice, hepatitis, stomatitis, constipation, weight gain
**GU:** *Retention,* acute renal failure
**HEMA:** Agranulocytosis, thrombocytopenia, eosinophilia, leukopenia
**INTEG:** Rash, urticaria, sweating, pruritus, photosensitivity

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well |
| **Distribution** | Widely, protein binding 92% |
| **Metabolism** | Extensively, liver by CYP2D6, 7% of population may be poor metabolizers |
| **Excretion** | Unknown |
| **Half-life** | 12-24 hr |

### Pharmacodynamics

| | |
|---|---|
| Onset | Unknown |
| Peak | 4-6 hr |
| Duration | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
Cimetidine, dilTIAZem, fluvoxaMINE, FLUoxetine, PARoxetine, sertraline, verapamil: increased desipramine level
CloNIDine: increased life-threatening B/P elevations, do not use concurrently
EPINEPHrine, norepinephrine: increased hypertension
Gatifloxacin, levofloxacin, moxifloxacin, sparfloxacin, SUNItinib, vorinostat, ziprasidone: increased serotonin syndrome, neuroleptic malignant syndrome

### Drug classifications

Barbiturates, opioids, CNS depressants: increased CNS depression, skeletal muscle relaxants
**MAOIs:** increased hyperpyrexia, seizures, excitation; do not use within 14 days of MAOIs
SSRIs, SNRIs, serotonin-receptor agonists, other tricyclic antidepressants: increased serotonin syndrome, neuroleptic malignant syndrome
Class IA/III dysrhythmics, tricyclic antidepressants: increased QT interval

### Drug/herb

Kava, valerian: increased CNS depression
St. John's wort: may increase serotonin syndrome; avoid concurrent use

### Drug/lab test

Increase: serum bilirubin, blood glucose, alkaline phosphatase
Decreased: sodium

## NURSING CONSIDERATIONS

### Assessment

• **Pain: Before and periodically**
• Monitor B/P (lying, standing), pulse q4hr; if systolic B/P drops 20 mm Hg, hold product, notify prescriber; take vital signs q4hr in patients with CV disease
• Monitor blood studies: CBC, leukocytes, differential, cardiac enzymes if patient is receiving long-term therapy
• Monitor hepatic studies: AST, ALT, bilirubin, monitor leukocytes, differential counts; monitor blood glucose and cholesterol in those who are overweight
• Check weight qwk, BMI initially and periodically; appetite may increase with this product
• Monitor ECG for flattening T wave, bundle branch block, AV block, dysrhythmias in cardiac patients
• Assess for **EPS** primarily in geriatric: rigidity, dystonia, akathisia
• Assess for **seizure activity** in those with a history of seizures, may be before cardiac events

**BLACK BOX WARNING: Depression:** assess mental status: mood, sensorium, affect, **suicidal tendencies,** increase in psychiatric symptoms: depression, panic; this product is not indicated for children, monitor mental status baseline and during first few months of treatment

• Assess for urinary retention, constipation; constipation most likely in children
• Assess for **withdrawal symptoms:** headache, nausea, vomiting, muscle pain, weakness; not usual unless product is discontinued abruptly
• Assess for alcohol consumption; if consumed, hold dose until morning

### Patient/family education

• Advise patient that therapeutic effects may take 2-3 wk
• **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefit outweighs fetal risk, avoid breastfeeding, excretion unknown
• **Beers:** Avoid in older adults with or at high risk for delirium, assess for confusion; highly anticholinergic

**BLACK BOX WARNING:** Teach patient that suicidal thoughts and behavior may occur, notify prescriber immediately

• Advise patient to use caution in driving, other activities requiring alertness because of drowsiness, dizziness, blurred vision
• Teach patient to avoid alcohol ingestion, other CNS depressants
• Teach patient not to discontinue medication quickly after long-term use; may cause nausea, headache, malaise
• Teach patient to wear sunscreen or large hat, since photosensitivity occurs

### Evaluation

**Positive therapeutic outcome**
• Decreased depression

## TREATMENT OF OVERDOSE:

ECG monitoring; induce emesis; lavage, administer anticonvulsant

## desmopressin (Rx)

(des-moe-press'in)
**DDAVP, DDAVP Rhinal Tube, DDAVP Rhinyle Drops Minirin, Noctiva, Octostim, Stimate**
*Func. class.:* Pituitary hormone
*Chem. class.:* Synthetic antidiuretic hormone

## ACTION:

Promotes reabsorption of water by action on renal tubular epithelium in the kidney; causes smooth muscle constriction and increase in plasma factor VIII levels, which increases platelet aggregation resulting in vasopressor effect; similar to vasopressin

**Therapeutic outcome:** Prevention of nocturnal enuresis, decreased bleeding in hemophilia A, von Willebrand's disease type 1, control and stabilization of water in diabetes insipidus

## USES:

Hemophilia A, von Willebrand's disease type 1, nonnephrogenic diabetes insipidus, symptoms of polyuria/polydipsia caused by pituitary dysfunction, nocturnal enuresis

## CONTRAINDICATIONS

Hypersensitivity, nephrogenic diabetes insipidus, severe renal disease

**BLACK BOX WARNING:** Hyponatremia

**Precautions:** Pregnancy, breastfeeding, CAD, hypertension, cystic fibrosis, thrombus, electrolyte imbalances, male infertility

## DOSAGE AND ROUTES

### Primary nocturnal enuresis (unlabeled)

**Adult and child ≥6 yr:** INTRANASAL 20 mcg (half in each nostril) at bedtime, may increase to 40 mcg; PO 0.2 mg at bedtime, may be increased to max 0.6 mg at bedtime

### Nephrogenic diabetes insipidus temporary polyuria, polydipsia, related to pituitary trauma

**Adult:** INTRANASAL 10-40 mcg in divided doses (1-4 sprays with pump); SUBCUT/**IV** 2-4 mcg/day or SUBCUT in 2 divided daily in divided doses
**Child 3 mo-12 yr:** INTRANASAL 5-30 mcg in divided doses

### Hemophilia/von Willebrand's disease

**Adult and child >3 mo: IV** 0.3 mcg/kg in NaCl over 15-30 min; may repeat if needed
**Adult/child >11 mo:** Nasal spray: 33 mcg (1 spray in each nostril), give 2 hr before surgery

### Antihemorrhagic

**Adult and child >3 mo: IV** 0.3 mcg/kg
**Adult and child <50 kg:** INTRANASAL 1 spray in one nostril
**Adult and child >50 kg:** 1 spray each nostril
**Adult:** SUBCUT/IV 0.2-0.4 mcg/kg dose

### Noctiva

**Adults:** 50-64 yr, Noctiva nasal spray 1 spray in each nostril 30 min before going to bed (use in those not at increased risk for hyponatremia)

**Available forms:** Inj 4, 15 mcg/ml, Rhinal Tube delivery 2.5 mg/vial (0.1 mg/ml); tabs 0.1, 0.2 mg; nasal spray pump (DDAVP) 10 mcg/spray (0.1 mg/ml); nasal spray (Stimate) 1.5 mg/ml (150 mcg/dose)

### Implementation

**PO route**

- Store at room temperature
- Draw medication into tube, insert tube into nostril to instill product and blow on other end to deliver sol into nasal cavity; rinse after use
- Store in refrigerator or cool environment

**Nasal route**

- DDAVP and Stimate are not interchangeable
- Prime prior to first dose (press down 4 times), pump stays primed for 1 wk; to reprime, press down 1 time
- Noctiva: Do not shake bottle, prime by pumping 5 times into the air, away from the face, if not used >3 days, reprime with 2 actuations, have patient blow nose, tilt head back slightly, close then open nostril, inhale while pumping 1 time, wipe applicator, and replace cap

**IV, direct route**

- Give undiluted over 1 min in diabetes insipidus

**Intermittent IV infusion route**

- Give single dose diluted in 50 ml of 0.9% NaCl (adult and child >10 kg); a single dose/10 ml as an **IV** inf over 15-30 min in von Willebrand's disease or hemophilia A
- Store in refrigerator

## ADVERSE EFFECTS

**CNS:** Drowsiness, headache, lethargy, flushing, seizures
**CV:** Increased B/P, palpitations, tachycardia
**EENT:** Nasal irritation, congestion, rhinitis
**GI:** Nausea, heartburn, cramps
**GU:** *Vulval pain*
**META:** Hyponatremia, hyponatremia-induced seizures
**SYST:** Anaphylaxis (IV)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Nasal (up to 20%) |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown; breast milk |

### Pharmacodynamics

| | PO | Intranasal | SUBCUT/IV |
|---|---|---|---|
| **Onset** | 1 hr | 1 hr | Rapid |
| **Peak** | 4-7 hr | 1-4 hr | 15-30 min |
| **Duration** | Unknown | 8-20 hr | 3 hr |

## INTERACTIONS

### Individual drugs

Alcohol, demeclocycline, EPHINEPHrine (large doses), heparin, lithium: decreased antidiuretic action
CarBAMazepine, chlorproPAMIDE, clofibrate: increased antidiuretic action, SSRIs, lamoTRIgine

### Drug classifications

Pressor products: increased pressor effect

## NURSING CONSIDERATIONS

D

### Assessment

- Monitor I&O ratio, urine osmolality, specific gravity, weight daily; check for edema in extremities; if water retention is severe, diuretic may be prescribed; check pulse, B/P when giving product **IV** or SUBCUT
- **Assess for water intoxication:** lethargy, behavioral changes, disorientation, neuromuscular excitability, dehydration, poor skin turgor, severe thirst, dry skin, tachycardia
- Assess intranasal use: nausea, congestion, cramps, headache; usually decreased with decreased dosage
- Assess for allergic reaction, including anaphylaxis **(IV route)**, notify prescriber, discontinue use
- Assess for nasal mucosa changes: congestion, edema, discharge, scarring (nasal route)
- **Diabetes insipidus:** Monitor urine volume osmolality and plasma osmolality, monitor for dry skin, poor turgor, thirst (dehydration)
- Nocturia enuresis: Identify how often enuresis is occurring, avoid use in those prone to water intoxication or sodium depletion
- **Hemophilia/Von Willebrand's disease:** Monitor factor VIII coagulant activity before using for hemostasis, assess for bleeding frank and occult
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefit outweighs fetal risk, cautious use in breastfeeding, excretion is unknown

### Patient/family education

- Use demonstration, return demonstration to teach technique for nasal instillation, clear nasal passage before use
- Teach patient to notify prescriber of dyspnea, vomiting, cramping, drowsiness, headache, nasal congestion
- Caution patient to avoid OTC products (cough, hay fever), since these preparations may contain EPINEPHrine and decrease product response; do not use with alcohol
- Advise patient to carry/wear emergency ID or other identification specifying disease and medication used
- Advise patient if dose is missed, take when remembered, up to 1 hr before next dose; do not double doses; avoid fluids from 1 hr to up to 8 hr after PO dose

- Teach patient to report upper respiratory infection, nasal congestion
- How to use subcut, rotate sites

### Evaluation

**Positive therapeutic outcome**
- Absence of severe thirst
- Decreased urine output, osmolality
- Absence of bleeding (hemophilia)

## desonide topical
*See Appendix B*

## desoximetasone topical
*See Appendix B*

## desoxyribonuclease
*See fibrinolysin/desoxyribonuclease*

## desvenlafaxine (Rx)
**Khedezla, Pristiq**

*Func. class.:* Antidepressant, serotonin-receptor norepinephrine reuptake inhibitor (SNRI)

**Do not confuse:** Pristiq/PriLOSEC

**ACTION:** May work by blocking the central presynaptic reuptake of 5-HT and NE, resulting in an increased sustained level of these neurotransmitters.

**Therapeutic outcome:** Decreased depression, increased sense of well-being and renewed interest in activities

**USES:** Major depressive disorder

**Unlabeled uses:** Vasomotor symptoms (hot flashes) associated with menopause

## CONTRAINDICATIONS
Hypersensitivity to this product or venlafaxine, MAOI therapy

**Precautions:** CNS depression, abrupt discontinuation, hypertension, hepatic/renal disease, hyponatremia, geriatric patients, pregnancy, labor and delivery, breastfeeding, angina, bleeding, cardiac dysrhythmias, MI, stroke, mania, hypovolemia, dehydration, increased intraocular pressure

**BLACK BOX WARNING:** Children, suicidal ideation

## DOSAGE AND ROUTES
### Major depressive disorder
**Adult: PO** Initially, 50 mg daily; max 400 mg/day with adjustments as needed

**Available forms:** Ext rel tabs 25, 50, 100 mg

### Renal/hepatic dose
**Adult:** PO CCr 30-50 ml/min 50 mg daily; CCr <30 ml/min or end-stage renal disease 50 mg every other day; moderate to severe hepatic disease, max 100 mg/day

## ADVERSE EFFECTS
**CNS:** *Dizziness,* drowsiness, *headache*, tremor, paresthesias, asthenia, suicidal thoughts and behaviors, seizures, chills, yawning, hot flashes, flushing, *irritability, insomnia, anxiety, abnormal dreams, fatigue*

**CV:** Palpitations, sinus tachycardia, increased blood pressure, orthostatic hypotension

**EENT:** Blurred vision, mydriasis, tinnitus, bruxism

**GI:** *Nausea,* xerostomia, *diarrhea*, constipation, vomiting, anorexia, weight loss, dysgeusia, hypercholesterolemia, hypertriglyceridemia

**GU:** Urinary retention/hesitancy, orgasm dysfunction, decreased libido, impotence, proteinuria

**HEMA:** Impaired platelet aggregation

**INTEG:** Photosensitivity, hyperhidrosis, diaphoresis

**SYST:** Serotonin syndrome, neuroleptic malignant syndrome-like symptoms, toxic epidermal necrolysis, rash, Stevens-Johnson syndrome, erythema multiforme, angioedema; neonatal abstinence syndrome (fetal exposure)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 30%; enters breast milk |
| **Metabolism** | Liver, 55% |
| **Excretion** | Urine, unchanged, 45% |
| **Half-life** | Elimination 11 hr, increased in hepatic/renal disease |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 7.5 hr |
| **Duration** | 24 hr |

## INTERACTIONS
### Individual drugs
Dexfenfluramine, dexmethylphenidate, dextromethorphan, fenfluramine, linezolid, lithium, nefazodone, meperidine, methylphenidate, mirtazapine, pentazocine, phentermine, promethazine, sibutramine, SUMAtriptan, traZODone, tryptophan: do not administer concurrently; increased serotonin syndrome, neuroleptic malignant syndrome-like reactions

Zolpidem: increased hallucinations, delusions, disorientation

### Drug classifications

Anticoagulants, NSAIDs, platelet inhibitors, salicylates, thrombolytics: increased bleeding risk

Alcohol, antihistamines, opioids, sedatives/hypnotics: increased CNS depression

Ergots, MAOIs, serotonin receptor agonists (almotriptan, eletriptan, frovatriptan, methylene blue IV, naratriptan, rizatriptan, SUMAtriptan, ZOLMitriptan), SSRIs, other SNRIs, TCAs, tricyclics: do not administer concurrently; increased serotonin syndrome, neuroleptic malignant syndrome-like reactions

### Drug/herb

Kava, valerian: increased desvenlafaxine action

### Drug/lab test

Increased: sodium, cholesterol, triglycerides
False positive: amphetamine, phencyclidine

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Suicidal thoughts/behaviors:** Assess mental status and mood, identify suicidal ideation

- **Serotonin syndrome, neuroleptic malignant syndrome-like symptoms:** Assess for nausea/vomiting, sedation, dizziness, diaphoresis (sweating), facial flush, hallucinations, mental status changes, myoclonia, restlessness, shivering, elevated blood pressure, hyperthermia, muscle rigidity, autonomic instability, and mental status changes; if serotonin syndrome occurs discontinue desvenlafaxine, and any other serotonergic agents
- **Serious skin reactions:** assess during treatment and after, discontinue product immediately if rash develops
- Monitor B/P baseline and periodically during treatment, lipid levels, signs of glaucoma
- Assess appetite and nutritional intake, weight loss is common, change diet as need to support weight
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, discontinue breastfeeding or product

### Patient/family education

- Teach patient to take as directed, not to double or skip doses; if a dose is missed, take as soon as remembered unless close to next dose, do not discontinue abruptly, decreased gradually

**BLACK BOX WARNING:** Advise patient to report immediately suicidal thoughts or behaviors, have family members look for symptoms of suicidal ideation

- Inform patient not to operate machinery or engage in hazardous activities until reaction ins known, may cause dizziness, drowsiness
- Teach patient to avoid all others products unless approval by prescriber
- Teach patient to report if pregnancy is planned or suspected, pregnancy, or if breastfeeding
- **Serious skin reactions:** Teach patient to report immediately allergic reactions including, rash, hives, difficulty breathing, or swelling of face, lips
- Advise patient that continuing follow-up exams will be needed
- **Serotonin syndrome, neuroleptic malignant syndrome:** Teach patient to report immediately nausea, vomiting, sedation, dizziness, sweating, facial flush

### Evaluation

**Positive therapeutic outcome**

- Decreased depression, increased sense of well-being and renewed interest in activities

## dexamethasone (Rx)

(dex-ah-meth'ah-sone)
**Dexasone**

## dexamethasone sodium phosphate (Rx)

*Func. class.:* Corticosteroid, synthetic
*Chem. class.:* Glucocorticoid, long-acting

**Do not confuse:** Decadron/Percodan

**ACTION:** Decreases inflammation by suppressing migration of polymorphonuclear leukocytes, fibroblasts, reversing increased capillary permeability and lysosomal stabilization, suppresses normal immune response, no mineralocorticoid effects

**USES:** Inflammation, allergies, neoplasms, cerebral edema, septic shock, collagen disorders, dexamethasone suppression test for Cushing syndrome, adrenocortical insufficiency, TB, meningitis, acute exacerbations of MS

## CONTRAINDICATIONS

Psychosis, hypersensitivity to corticosteroids, sulfites, or benzyl alcohol, idiopathic thrombocytopenia, acute glomerulonephritis, amebiasis, fungal infections, nonasthmatic bronchial disease, child <2 yr, AIDS, TB, glaucoma, ocular infection

**Precautions:** Pregnancy, breastfeeding, diabetes mellitus, osteoporosis, seizure disorders, ulcerative colitis, HF, myasthenia gravis, renal disease, peptic ulcer, esophagitis, recent MI, hypertension, TB, active hepatitis, psychosis, sulfite hypersensitivity, thromboembolic disorders, abrupt discontinuation, coagulopathy, ulcerative colitis, seizure disorders

## DOSAGE AND ROUTES

### Inflammatory condition/neoplasias

**Adult:** PO 0.75-9 mg/day, in divided doses q6-12hr; or phosphate IM 0.5-9 mg/day divided q6-12hr
**Child:** PO 0.024-0.34 mg/kg/day in divided doses q6-12hr

### Shock

**Adult:** **IV** (phosphate) single dose 1-6 mg/kg or **IV** 40 mg q2-6hr as needed up to 72 hr

### Airway edema/extubation

**Adult:** PO/IM/IV 0.5-2 mg/kg/day divided q6hr, use 24 hr before extubation

### Chemotherapy-induced vomiting

**Adult:** PO/IV 10-28 mg 15-30 min before chemotherapy or 10 mg q12hr on each treatment day
**Child:** IV 5-20 mg 15-30 min before chemotherapy

### Cerebral edema

**Adult:** **IV** (phosphate) 10 mg, then 4-6 mg IM q6hr × 2-4 days, then taper over 1 wk
**Child:** PO/IM/**IV** loading dose 1-2 mg/kg, then 1-1.5 mg/kg/day, max 16 mg/day divided q4-6hr for 2-4 days, then taper down qwk

### Palliative management of recurrent or inoperable brain tumors

**Adult:** IM/IV 2 mg bid-tid maintenance

### Adrenocortical insufficiency

**Adult:** PO 0.75-9 mg/day in divided doses
**Child:** PO 0.03-0.3 mg/kg/day divided in 2-4 doses

### Suppression test for Cushing's syndrome

**Adult:** PO 1 mg at 11 PM or 0.5 mg q6hr × 48 hr

**Available forms:** **Dexamethasone:** tabs 0.5, 0.75, 1, 1.5, 2, 4, 6 mg; elix 0.5 mg/5 ml; oral sol 0.5 mg/5 ml, 1 mg/ml; **sodium phosphate** 4, 10 mg/ml; ophth implant 0.7 mg; ophth susp drops/sol 0.1%

### Implementation

**PO route**

- Give with food or milk to decrease GI symptoms
- Provide assistance with ambulation in patient with bone tissue disease to prevent fractures, give once a day in AM for less toxicity, less adverse reactions

**IM route**

- IM inj deep in large muscle mass; rotate sites; avoid deltoid; use 21-G needle
- In one dose in AM to prevent adrenal suppression; avoid SUBCUT administration, may damage tissue

**Intraarticular/intralesion**

- Use rarely as injections may damage joints

**Direct IV route (sodium phosphate)**

- **IV** undiluted direct over 1 min or less
- Titrated dose; use lowest effective dose

**Intermittent IV infusion route**

- Diluted with 0.9% NaCl or $D_5W$ and give as an **IV** inf at prescribed rate

### Dexamethasone sodium phosphate

**Y-site compatibilities:** Acetaminophen, acyclovir, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amphotericin B cholesteryl, amphotericin B lipid complex, amphotericin B liposome, amsacrine, anidulafungin, argatroban, ascorbic acid injection, atenolol, atracurium, atropine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, CARBOplatin, carmustine, ceFAZolin, cefepime, cefonicid, cefoTEtan, cefOXitin, cefpirome, ceftaroline, cefTAZidime, ceftizoxime, cefTRIAXone, chloramphenicol, cimetidine, cisatracurium, CISplatin, cladribine, clindamycin, codeine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, DAUNOrubicin liposome, dexmedetomidine, digoxin, dilTIAZem, DOCEtaxel, DOPamine, doripenem, doxacurium, DOXOrubicin, DOXOrubicin liposomal, enalaprilat, ePHEDrine, EPINEPHrine, epoetin alfa, eptifibatide, ertapenem, etoposide, etoposide phosphate, famotidine, fentaNYL, filgrastim, fluconazole, fludarabine, fluorouracil, folic acid, fosaprepitant, foscarnet, furosemide, ganciclovir, gatifloxacin, gemcitabine, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, ifosfamide, imipenem-cilastatin, indomethacin, insulin (regular), irinotecan, isoproterenol, ketorolac, lansoprazole, leucovorin, levofloxacin, lidocaine, linezolid, liposome, LORazepam, LR, mannitol, mechlorethamine, melphalan, meropenem, metaraminol, methadone, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, mezlocillin, milrinone, morphine, multiple vitamins injection, nafcillin, nalbuphine, naloxone, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin,

oxyCODONE, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, PEMEtrexed, penicillin G potassium/sodium, PENTobarbital, PHENobarbital, phenylephrine, phytonadione, piperacillin, piperacillin-tazobactam, potassium chloride, procainamide, propofol, propranolol, pyridoxine, raNITIdine, remifentanil, Ringer's, ritodrine, riTUXimab, sargramostim, sodium acetate/bicarbonate, succinylcholine, SUFentanil, tacrolimus, telavancin, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA, tolazoline, topotecan, trastuzumab, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, vitamin B complex/C, voriconazole, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CNS:** *Depression, flushing, sweating,* headache, mood changes, euphoria, psychosis, seizures, insomnia, pseudotumor cerebri
**CV:** *Hypertension,* circulatory collapse, thromboembolism, heart failure, dysrhythmias, tachycardia, edema, cardiomyopathy
**EENT:** Fungal infections, increased intraocular pressure, blurred vision, cataracts, glaucoma
**ENDO:** Hypothalmic-pituitary-adrenal axis suppression, hyperglycemia, sodium, fluid retention
**GI:** *Diarrhea, nausea, abdominal distention,* GI hemorrhage, *increased appetite,* pancreatitis
**HEMA:** Thrombocytopenia, transient leukocytosis, thromboembolism
**INTEG:** Acne, poor wound healing, ecchymosis, petechiae, hirsutism, angioedema
**META:** Hypokalemia
**MS:** Fractures, osteoporosis, weakness, arthralgia, myopathy

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | 1-2 days |

### Pharmacodynamics

| | PO | IM | IV |
|---|---|---|---|
| **Onset** | 1 hr | 1 hr | 1 hr |
| **Peak** | 1-2 hr | 1 hr | 1 hr |
| **Duration** | 2½ days | 6 days-3 wk | Varies |

## INTERACTIONS

### Individual drugs

Alcohol, amphotericin B, cycloSPORINE, digoxin, indomethacin: increased side effects
Ambemonium, isoniazid, neostigmine, sometrem: decreased effects of each specific product
Bosentan, carBAMazepine, cholestyramine, colestipol, ePHEDrine, ethotoin, phenytoin, rifAMPin, theophylline: decreased action of dexamethasone
CycloSPORINE, tacrolimus: increased effect of each drug
Ketoconazole, NSAIDs: increased action of dexamethasone

### Drug classifications

Antacids, barbiturates: decreased action of dexamethasone
Antibiotics (macrolide), contraceptives (hormonal), estrogens, salicylates: increased action of dexamethasone
Anticholinesterases, anticoagulants, anticonvulsants, antidiabetics, salicylates, toxoids/vaccines: decreased effects of each specific product
Antidiabetics: increased effect of these products
Diuretics, NSAIDs, salicylates: increased side effects
Quinolones: increased risk of tendinitis, tendon rupture
Thiazide diuretics: decreased potassium levels/loop, amphotericin B

### Drug/lab test

Increased: cholesterol, Na, blood glucose, uric acid, Ca, urine glucose
Decreased: Ca, potassium, $T_4$, $T_3$, thyroid $^{131}I$ uptake test, urine 17-OHCS, 17-KS, PBI
False negative: skin allergy tests

## NURSING CONSIDERATIONS

### Assessment

- Monitor K, blood, urine glucose while on long-term therapy; hypokalemia and hyperglycemia
- Monitor weight daily; notify prescriber of weekly gain >5 lb
- Monitor B/P, pulse; notify prescriber of chest pain
- Monitor I&O ratio; be alert for decreasing urinary output, increasing edema
- **Epidural injections (unlabeled):** may cause rare events (vision loss, paralysis, stroke, death)
- Monitor plasma cortisol levels during long-term therapy (normal: 138-635 nmol/L when assessed at 8 AM), prolonged use can cause **cushingoid symptoms** (buffalo hump, moon face, increased B/P)
- **Assess infection:** fever, WBC even after withdrawal of medication; product masks infection
- **Assess potassium depletion:** paresthesias, fatigue, nausea, vomiting, depression, polyuria, dysrhythmias, weakness

• Assess edema, hypertension, cardiac symptoms
• Assess mental status: affect, mood, behavioral changes, aggression
• **Abrupt withdrawal:** acute adrenal insufficiency and death may occur following abrupt discontinuation of systemic therapy; withdraw gradually
• **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, discontinue breastfeeding or product

### Patient/family education
• Advise that emergency ID as corticosteroid user should be carried or worn
• Teach to notify prescriber if therapeutic response decreases; dosage adjustment may be needed
• Teach not to discontinue abruptly or adrenal crisis can result
• Teach to avoid OTC products: salicylates, alcohol in cough products, cold preparations unless directed by prescriber
• Instruct patient to contact prescriber if surgery, trauma, stress occurs, dosage may need to be adjusted
• Teach patient all aspects of product use, including cushingoid symptoms
• Instruct patient to notify prescriber of infection
• Teach patient to take with food or milk
• Teach patient that bruising may occur easily
• Teach patient that if on long-term therapy, a high-protein diet may be needed
• Teach symptoms of adrenal insufficiency: nausea, anorexia, fatigue, dizziness, dyspnea, weakness, joint pain
• Advise patient to avoid exposure to chickenpox or measles, persons with infections

### Evaluation
**Positive therapeutic outcome**
Decreased inflammation

## dexamethasone ophthalmic
*See Appendix B*

## dexlansoprazole (Rx)
(dex-lan-so-prey′zole)
**Dexilant**
*Func. class.:* Anti-ulcer–proton pump inhibitor
*Chem. class.:* Benzimidazole

**ACTION:** Suppresses gastric secretion by inhibiting hydrogen/potassium ATPase enzyme system in gastric parietal cell; characterized as gastric acid pump inhibitor, since it blocks final step of acid production

**Therapeutic outcome:** Reduction in gastric pain, swelling, fullness

**USES:** Gastroesophageal reflux disease (GERD), severe erosive esophagitis, heartburn

## CONTRAINDICATIONS
Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, proton-pump hypersensitivity, gastric cancer, hepatic disease, vit $B_{12}$ deficiency, colitis

## DOSAGE AND ROUTES
### Erosive esophagitis
**Adult: PO** 60 mg qd for up to 8 wk; maintenance: PO 30 mg qd for up to 6 mo

### GERD
**Adult: PO:** 30 mg qd × 4 wk

### Hepatic disease
**Adult:** PO (Child-Pugh B): max 30 mg/day

**Available forms:** Del rel caps 30, 60 mg

### Implementation
• Swallow del rel cap whole; do not break, crush, chew; caps may be opened and contents sprinkled on food, use immediately; do not chew contents of caps, give without regard to food

## ADVERSE EFFECTS
**CNS:** Headache, dizziness, confusion, agitation, amnesia, depression, anxiety, seizures, insomnia
**CV:** Chest pain, angina, bradycardia, palpitations, CVA, hypertension, MI
**EENT:** Tinnitus
**GI:** Diarrhea, abdominal pain, vomiting, nausea, constipation, flatulence, colitis, dysgeusia, pseudomembranous colitis
**HEMA:** Anemia, neutropenia, thrombocytopenia, pernicious anemia, thrombosis
**INTEG:** Rash, urticaria, pruritus
**META:** Gout
**MS:** Arthralgia, myalgia
**RESP:** Upper respiratory infections, cough, epistaxis, dyspnea
**SYST:** Anaphylaxis, Stevens-Johnson syndrome, toxic epidermal necrolysis, exfoliative dermatitis, pneumonia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 57%-64% |
| **Distribution** | Protein binding 97% |
| **Metabolism** | Liver extensively by CYP2C19/CYP3A4; 15%-20% of Asian patients, 3%%-5% of Black and Caucasian patients are poor metabolizers |
| **Excretion** | Urine, feces; clearance decreased in geriatric, renal/hepatic disease |
| **Half-life** | Plasma 1-2 hr, 4-5 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Ampicillin, calcium carbonate, delavirdine, iron, itraconazole, ketoconazole: decreased absorption of each specific product

### Drug classifications

CYP2C19, CYP3A4 (fluvoxamine, voriconazole): increased dexlansoprazole effect

Sucralfate: delayed absorption of dexlansoprazole

### Drug/herb

Decrease: dexlansoprazole effect, St. John's wort

### Drug/lab test

Increased: LFTs, bilirubin, creatinine, glucose, lipids

Decreased: platelets, magnesium

## NURSING CONSIDERATIONS

### Assessment

- **Pseudomembranous colitis:** diarrhea, abdominal cramps, fever, report to prescriber promptly (rare)
- Anaphylaxis, serious skin disorders requiring emergency intervention (rare)
- **Hepatotoxicity:** Hepatitis, jaundice, monitor liver enzymes (AST, ALT, alkaline phosphatase) during treatment if hepatic adverse reactions occur (rare)
- **Hypomagnesemia:** Usually 3 months to 1 yr after beginning therapy; monitor magnesium level, assess for irregular heart beats, muscle spasms; in children fatigue, upset stomach, dizziness; magnesium supplement may be used
- **Pregnancy/breastfeeding:** use only if clearly needed, no well-controlled studies, discontinue breastfeeding or product, excretion unknown
- **Beers:** Avoid scheduled use >8 wk in older adults who are at high risk for erosive esophagitis, pathological hypersecretory conditions

### Patient/family education

- **Pseudomembranous colitis:** report to prescriber at once abdominal cramps, bloody diarrhea, fever
- Inform diabetic patient that hypoglycemia may occur
- Encourage patient to avoid hazardous activities; dizziness may occur
- Tell patient to avoid alcohol, salicylates, ibuprofen; may cause GI irritation
- Teach patient to report allergic reactions, symptoms of low magnesium levels
- Teach patient to notify prescriber if pregnancy is planned or suspected, not to breastfeed
- Advise patient to swallow cap whole, not to chew, crush, to report all products being used to prescriber

### Evaluation

#### Positive therapeutic outcome

- Absence of gastric pain, swelling, fullness; healing of erosive esophagitis

## dextromethorphan (OTC)

(dex-troe-meth-or'fan)

**Balminil, Buckley's Mixture, Delsym 12-Hour, ElixSure Cough, Koffex, Robafen Cough Gels, Robitussin, Robitussin Cough with Honey, Robitussin Long-Acting Cough, Scot-Tussin Diabetes CF, Triaminic Long-Acting Cough, Vicks Formula 44 Cough Relief, Wal-Tussin**

*Func. class.:* Antitussive, nonopioid

*Chem. class.:* Levorphanol derivative

**ACTION:** Depresses cough center in medulla by direct effect related to levorphanol

**Therapeutic outcome:** Absence of cough

**USES:** Nonproductive cough carried by minor respiratory tract infections or irritants that might be inhaled

## CONTRAINDICATIONS

Hypersensitivity, MAOIs, SSRIs

**Precautions:** Pregnancy, fever, hepatic disease, asthma/emphysema, chronic cough, child <4 yr, breastfeeding

## DOSAGE AND ROUTES

**Adult and child ≥12 yr:** PO 10-20 mg q4hr, or 30 mg q6-8hr, max 120 mg/day; SUS REL LIQUID 60 mg q12hr, max 120 mg/day

**Child 6-11 yr:** PO 5-10 mg q4hr; SUS REL LIQUID 30 mg bid, max 60 mg/day; LOZENGE 5-10 mg q1-4hr, max 60 mg/day

**Available forms:** Liquid 7.5, 15 mg/5 ml; syr 15 mg/15 ml, 10 mg/5 ml; 15 mg/5 ml, 30 mg/15 ml; caps 15 mg; gel caps 15 mg; EXT REL SUSP 30 mg/5 ml

### Implementation

- Give **chew tabs:** chew well; **syrup:** use calibrated measuring device; **ext rel susp:** shake well, use calibrated measuring device
- Administer decreased dosage to geriatric patients; their metabolism may be slowed; do not provide water within 30 min of administration because it dilutes product
- Shake susp before administration

## ADVERSE EFFECTS

**CNS:** *Dizziness,* sedation, confusion, ataxia, fatigue
**GI:** *Nausea*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid (PO); slow (SUS REL) |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | Terminal 11 hr |

### Pharmacodynamics

| | PO | PO-sus |
|---|---|---|
| **Onset** | 15-30 min | Unknown |
| **Peak** | Unknown | Unknown |
| **Duration** | 3-6 hr | 12 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
Amiodarone, quiNIDine, sibutramine: increased adverse reactions
Furazolidone, linezolid, procarbazine: increased hypotension, hyperpyrexia; do not give within 2 wk (MAOI activity)

### Drug classifications

Antihistamines, antidepressants, opiates, sedative-hypnotics: increased CNS depression
MAOIs: increased hypotension, hyperpyrexia, do not give within 2 wk of MAOIs
Serotonin receptor agonists, SSRIs: increased serotonin syndrome

## NURSING CONSIDERATIONS

### Assessment

- **Serotonin syndrome:** Assess for confusion, restlessness, nausea, vomiting, slurred speech, notify prescriber, immediately stop product
- Assess **cough**: type, frequency, character, lung sounds including sputum; provide adequate hydration to 2 L/day to decrease viscosity of secretions unless contraindicated
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, avoid use in breastfeeding

### Patient/family education

- Caution patient to avoid driving or other hazardous activities until stabilized on this medication; may cause drowsiness, dizziness in some individuals
- Advise patient to avoid smoking, smoke-filled rooms, perfumes, dust, environmental pollutants, cleaners, which increase cough; may use gum, hard candy to prevent dry mouth
- Advise patient to avoid alcohol or other CNS depressants while taking this medication; drowsiness will be increased
- Caution patient that any cough lasting over a few days should be assessed by prescriber
- Teach patient not to use if breastfeeding, or in child <4 yr

### Evaluation

**Positive therapeutic outcome**

- Absence of dry, irritating cough

**⚠ HIGH ALERT**

## diazePAM (Rx)

(dye-az'e-pam)
**Diastat, Diazemuls ✱, Valium**
*Func. class.:* Antianxiety, anticonvulsant, skeletal muscle relaxant, central acting
*Chem. class.:* Benzodiazepine, long-acting
**Controlled substance schedule IV**

**Do not confuse:** diazePAM/Ditropan/LORazepam

**ACTION:** Potentiates the actions of GABA, especially in limbic system, reticular formation; enhances presympathetic inhibition, inhibits spinal polysynaptic afferent paths

**Therapeutic outcome:** Decreased anxiety, restlessness, insomnia

**USES:** Anxiety, acute alcohol withdrawal, adjunct in seizure disorders; preoperative skeletal muscle relaxation; rectally for acute repetitive seizures

## CONTRAINDICATIONS

Pregnancy, hypersensitivity to benzodiazepines, closed angle glaucoma, coma, myasthenia gravis, ethanol intoxication, hepatic disease, sleep apnea

**Precautions:** Breastfeeding, geriatric, debilitated, addiction, child <6 mo, asthma, renal disease, bipolar disorder, COPD, CNS depression, labor, Parkinson's disease, neutropenia, psychosis, seizures, substance abuse, smoking

**BLACK BOX WARNING:** Coadministration with other CNS depressants, respiratory depression

## DOSAGE AND ROUTES

### Anxiety/convulsive disorders

**Adult:** PO 2-10 mg bid-qid; IM/**IV** 2-10 mg q3-4hr
**Geriatric:** PO 2-2.5 mg daily-bid, increase slowly as needed
**Child >6 mo:** IM/**IV** 0.04-0.3 mg/kg/dose q2-4hr, max 0.6 mg/kg in an 8-hr period

### Precardioversion

**Adult:** **IV** 5-15 mg 5-10 min precardioversion

### Preendoscopy

**Adult:** **IV** 2.5-20 mg, IM 5-10 mg ½ hr preendoscopy

### Muscle relaxation

**Adult:** PO 2-10 mg tid-qid or EXT REL 15-30 mg daily; IM/**IV** 5-10 mg repeat in 2-4 hr

### Tetanic muscle spasms

**Child >5 yr:** IM/**IV** 5-10 mg q3-4hr prn
**Infant >30 days:** IM/**IV** 1-2 mg q3-4hr prn

### Status epilepticus

**Adult:** IM/**IV** 5-10 mg, 2 mg/min, may repeat q10-15min; max 30 mg; may repeat in 2-4 hr if seizures reappear
**Child >5 yr:** **IV** 1 mg slowly; IM 1 mg q2-5min
**Child 1 mo-5 yr:** **IV** 0.2-0.5 mg slowly; IM 0.2-0.5 mg slowly q2-5min up to 5 mg; may repeat in 2-4 hr prn

### Seizures other than status epilepticus

**Adult:** RECT 0.2 mg/kg, may repeat 4-12 hr later
**Child 6-11 yr:** RECT 0.3 mg/kg, may repeat 4-12 hr later
**Child 2-5 yr:** RECT 0.5 mg/kg, may repeat 4-12 hr later

### Alcohol withdrawal

**Adult:** **IV** 10 mg initially, then 5-10 mg q3-4hr prn

**Available forms:** Tabs 2, 5, 10 mg; inj 5 mg/ml; oral sol 5 mg/5 ml; rectal 2.5 (pediatric), 10, 20 mg, twin packs; ext rel cap 15 mg; rectal gel

### Implementation

**PO route**

- Give with food or milk for GI symptoms
- Crush tab if patient is unable to swallow medication whole
- Reduce opioid dosage by one third if given concomitantly with diazePAM
- Check to see if PO medication has been swallowed
- **Oral solution:** Use calibrated dropper only; mix with water, juice, pudding, applesauce; consume immediately

**Rectal route**

- Do not use more than 5 ×/mo or for an episode q5day (Diastat)

**Direct IV route**

- Administer **IV** into large vein; do not dilute or mix with any other product; give **IV** 5 mg or less/min or total dose over 3 min or more (children, infants); cont inf is not recommended; inject closest vein insertion as possible; do not dilute or mix with other products
- Check **IV** site for thrombosis or phlebitis, which may occur rapidly
- Observe for several hours after IV, if used in combination with opioids, decrease opioid dose

**Sterile emulsion for injection route**

- Use **IV** only, within 6 hr, flush line after use and after 6 hr

## ADVERSE EFFECTS

**CNS:** *Dizziness, drowsiness,* confusion, headache, anxiety, tremors, stimulation, fatigue, depression, insomnia, hallucinations, ataxia, fatigue
**CV:** *Orthostatic hypotension,* ECG changes, tachycardia, hypotension
**EENT:** *Blurred vision,* tinnitus, mydriasis, nystagmus
**GI:** Constipation, dry mouth, nausea, vomiting, anorexia, diarrhea
**HEMA:** Neutropenia
**INTEG:** Rash, dermatitis, itching
**RESP:** Respiratory depression

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid (PO); erratic (IM) |
| **Distribution** | Widely distributed; crosses blood-brain barrier, placenta; protein binding 99% |
| **Metabolism** | Liver, extensively, CYP2C19, CYP3A4 15%-20% of Asian patients and up to 5% of Caucasians and Black patients are poor metabolizers |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 1-12 days |

### Pharmacodynamics

| | PO | IM | IV |
|---|---|---|---|
| **Onset** | ½ hr | 15 min | Immediate |
| **Peak** | Peak 2 hr | ½-1½ hr | 15 min |
| **Duration** | Up to 24 hr | 1-1½ hr | 15 min-1 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression

Amiodarone, cimetidine, clarithromycin, dalfopristin, delavirdine, dilTIAZem, disulfiram, efavirenz, erythromycin, fluconazole, fluvoxaMINE, imatinib, itraconazole, ketoconazole, IV miconazole, nefazodone, niCARdipine, quinupristin, ranolazine, troleandomycin, valproic acid, verapamil, voriconazole, zafirlukast, zileuton: increased diazePAM effect

Cimetidine, valproic acid: increased toxicity

CYP3A4 inducers (carBAMazepine, ethotoin, fosphenytoin, phenytoins, rifAMPin), smoking: decreased diazePAM effect, monitor for increased sedation

Disulfiram, isoniazid, propranolol, valproic acid: decreased metabolism of diazePAM

### Drug classifications

Barbiturates, CNS depressants, CYP3A4 inhibitors, SSRIs: increased toxicity

CNS depressants: increased CNS depression

CYP3A4 inducers (barbiturates): decreased diazePAM effect

Oral contraceptives: decreased metabolism of diazePAM

### Drug/herb

Increase: CNS depression, kava, chamomile, valerian

### Drug/lab test

Increased: AST/ALT, alk phos

## NURSING CONSIDERATIONS

### Assessment

- **Assess degree of anxiety;** what precipitates anxiety and whether product controls symptoms; other signs of anxiety: dilated pupils, inability to sleep, restlessness, inability to focus
- **Assess for alcohol withdrawal symptoms,** including hallucinations (visual, auditory), delirium, irritability, agitation, fine to coarse tremors
- Monitor B/P (with patient lying, standing), pulse; if systolic B/P drops 20 mm Hg, hold product, notify prescriber
- Monitor blood studies: CBC during long-term therapy; blood dyscrasias have occurred (rarely); hepatic studies: ALT, AST

**BLACK BOX WARNING:** Avoid coadministration with other CNS depressants, do not use with opioids

- **Respiratory depression: Monitor for respiratory depression, respirations q5-15 min if given IV**
- **Monitor for seizure control:** type, duration, and intensity of seizures; what precipitates seizures
- Monitor hepatic studies: AST, ALT, bilirubin, creatinine, LDH, alkaline phosphatase
- **Assess mental status:** mood, sensorium, affect, sleeping pattern, drowsiness, dizziness, suicidal tendencies, and ability of product to control these symptoms; check for tolerance, withdrawal symptoms: headache, nausea, vomiting, muscle pain, weakness after long-term use, high dose
- Assess for muscle spasms, pain relief
- **Pregnancy/breastfeeding:** Use in pregnancy not recommended, do not breastfeed, excreted in breast milk
- **Beers:** Avoid use in older adults, may be appropriate for seizures, sleep disorders, benzodiazepine/ethanol withdrawal, severe anxiety disorders

### Patient/family education

- Advise patient that product may be taken with food; that product is not to be used for everyday stress or used longer than 4 mo unless directed by prescriber; take no more than prescribed amount; may be habit forming
- Caution patient to avoid OTC preparations unless approved by a prescriber; to avoid alcohol, other psychotropic medications unless prescribed; that smoking may decrease diazePAM effect by increasing diazePAM metabolism; not to discontinue medication abruptly after long-term use, gradually taper
- Inform patient to avoid driving, activities that require alertness; drowsiness may occur; to rise slowly or fainting may occur, especially in geriatric
- Advise patient not to become pregnant while using this product
- Inform patient that drowsiness may worsen at beginning of treatment
- Teach patient to notify prescriber if pregnancy is planned or suspected, avoid breastfeeding

### Evaluation

#### Positive therapeutic outcome

- Decreased anxiety, restlessness, insomnia

## TREATMENT OF OVERDOSE:
Lavage, VS, supportive care, flumazenil

### dibucaine topical
*See Appendix B*

### diclofenac ophthalmic
*See Appendix B*

### diclofenac epolamine (Rx)
(dye-kloe′fen-ak)
**Flector**

### diclofenac potassium (Rx)
**Cambia, Cataflam, Voltaren Rapide, Zipsor**

### diclofenac potassium (Rx)
**Apo-Diclo, Novo-Difenac, Nu-Diclo, Pennsaid, Sandoz Diclofenac, Solaraze Topical Gel, Voltram Topical Gel, Voltaren, Voltaren XR**

### diclofenac
**Zorvorex**

*Func. class.:* Nonsteroidal antiinflammatory drug (NSAID), nonopioid analgesic
*Chem. class.:* Phenylacetic acid

**Do not confuse:** Cataflam/Catapres

**ACTION:** Inhibits COX-1, COX-2 by blocking arachidonate, resulting in analgesic, antiinflammatory, antipyretic effects

**Therapeutic outcome:** Decreased pain, inflammation

**USES:** Acute, chronic rheumatoid arthritis, osteoarthritis, ankylosing spondylitis, analgesia, primary dysmenorrhea; patch: mild to moderate pain

## CONTRAINDICATIONS
Hypersensitivity to aspirin, iodides, other NSAIDs, bovine protein; asthma, serious CV disease; eczema, exfoliative dermatitis, skin abrasions (gel patch); treatment of perioperative pain in CABG surgery

**Precautions:** Breastfeeding, children, bleeding disorders, GI/cardiac disorders, hypersensitivity to other antiinflammatory agents, CCr <30 ml/min, accidental exposure, acute bronchospasm, hypersensitivity to benzyl alcohol; pregnancy patch, top sol, cap, powder for oral solution (pregnancy <30 wk, D >30 wk)

**BLACK BOX WARNING:** GI bleeding/perforation, MI, stroke

## DOSAGE AND ROUTES
### Osteoarthritis
**Adult:** PO (Cataflam) 50 mg bid-tid, max 150 mg/day; DEL REL (Voltaren) 50 mg bid-tid or 75 mg bid, max 150 mg/day; EXT REL (Voltaren-XR) 100 mg daily, max 150 mg/day; TOP gel 1% (Voltaren gel) 4 g for each lower extremity qid, max 16 g/day; 2 g for each upper extremity qid, max 8 g/day; TOP SOL (Pennsaid) apply 40 drops to each affected knee qid, apply 10 drops at a time, spread over entire knee

### Rheumatoid arthritis
**Adult:** PO (Cataflam) 50 mg tid-qid, max 200 mg/day; DEL REL (Voltaren) 50 mg tid-qid or 75 mg bid, max 200 mg/day; EXT REL (Voltaren-XR) 100 mg qd, may increase to 200 mg/day, max 200 mg/day

### Ankylosing spondylitis
**Adult:** PO DEL REL (Voltaren) 25 mg qid and 25 mg at bedtime, max 125 mg/day

### Acute migraine with/without aura
**Adult:** PO (powder for oral SOL) (Cambia) 50 mg as a single dose; mix contents of packet in 1-2 oz water

### Mild to moderate pain
**Adult:** PO (Zipsor) 25 mg qid

### Dysmenorrhea or nonrheumatic inflammatory conditions
**Adult:** PO (Cataflam) 50 mg tid or 100 mg initially, then 50 mg tid, max 200 mg 1st day, then 150 mg/day, immediate release only

### Pain of strains/sprains
**Adult:** TOP patch (Flector) apply patch to area bid

### Actinic keratosis
**Adult:** TOP gel (Solaraze) apply to area bid

### Hepatic dose
**Adult:** PO use lower dose

### Renal dose
Avoid use of top gel, patch, sol, potassium oral tab in advanced renal disease

**Available forms: Epolamine:** topical patch 1.3%; **potassium:** tabs 50 mg tabs, liquid filled 25 mg; **sodium:** del rel tabs (enteric-coated) 25, 50, 75, 100 mg; oral powder for sol 50 mg; topical gel 1%, 3%

### Implementation
**PO route**
- Do not break, crush, chew, or dissolve enteric-coated or ext rel tabs
- Administer with food or milk to decrease gastric symptoms

• Remain upright for ½ hr
• Store at room temperature

**Powder:**
• Mix powder in 30-60 ml water only, mix solution, have patient drink immediately

**Powder:**
• Powder (Cambia and Zorvolex) may be less effective if taken with food

**Powder:**
• Zorvolex capsules aren't interchangeable with other formulations or oral product

**Topical route (patch) (Flector)**
• Wash hands before handling patch
• Remove and release liner before administering
• Use only on normal, intact skin
• Remove before bath, shower, swimming, do not use heat or occlusive dressings
• Discard removed patch in trash away from children, pets
• Store at room temperature

**Topical route (gel)**
• Apply to intact skin, do not use heat or occlusive dressings
• Use only for osteoarthritis: mild-moderate pain
• Store at room temperature, avoid heat, do not freeze

**Ophthalmic route**
• Administer with patient recumbent or tilting head back; pull down on lower lid; when conjunctival sac is exposed, instill 1 drop; wait a few minutes before instilling other drops

## ADVERSE EFFECTS

**CNS:** *Dizziness, headache,* drowsiness, fatigue, tremors, confusion, insomnia, anxiety, depression, nervousness, paresthesia, muscle weakness

**CV:** HF, tachycardia, peripheral edema, palpitations, dysrhythmias, hypo/hypertension, fluid retention, MI, stroke

**EENT:** Tinnitus, hearing loss, blurred vision, laryngeal edema

**GI:** Nausea, anorexia, vomiting, diarrhea, jaundice, cholestatic hepatitis, constipation, flatulence, cramps, dry mouth, peptic ulcer, GI bleeding, hepatotoxicity, hematemesis

**GU:** Nephrotoxicity: dysuria, hematuria, oliguria, azotemia, cystitis, UTI

**HEMA:** Blood dyscrasias, epistaxis, anemia

**INTEG:** Purpura, rash, pruritus, sweating, erythema, petechiae, photosensitivity, alopecia

**META:** Hyperglycemia, hypoglycemia

**RESP:** Dyspnea, bronchospasm

**SYST:** Anaphylaxis, Stevens-Johnson syndrome, exfoliative dermatitis, toxic epidermal necrolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO, ophth) |
| **Distribution** | Crosses placenta; 99% bound to plasma proteins |
| **Metabolism** | Liver (50%) |
| **Excretion** | Breast milk |
| **Half-life** | 1-2 hr, patch 12 hr |

### Pharmacodynamics

| | PO | Ophth | TOP (Patch) |
|---|---|---|---|
| **Onset** | Unknown | Unknown | Unknown |
| **Peak** | 2-3 hr | Unknown | 12 hr |
| **Duration** | Unknown | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Aspirin: increased GI side effects
Cidofovir, cycloSPORINE, digoxin, lithium, methotrexate, phenytoin: increased toxicity

### Drug classifications

ACE inhibitors, β-blockers, diuretics: decreased antihypertensive effect
Anticoagulants, NSAIDs, platelet inhibitors, salicylates, SSRIs, thrombolytics: increased risk of bleeding
Antidiabetic agents: increased need for dosage adjustment
Diuretics: decreased effect of these products
Diuretics (potassium-sparing): hyperkalemia
NSAIDs, bisphosphonates, corticosteroids: increased GI side effects

### Drug/herb

Garlic, ginger, ginkgo: monitor for bleeding; increased bleeding risk

## NURSING CONSIDERATIONS

### Assessment

• **CABG:** do not use oral, top, gel, patch in perioperative pain in CABG surgery for 10-14 days

**BLACK BOX WARNING: Stroke/MI:** may increase HF and hypertension, increased CV thrombotic events that may be fatal; those with CV disease may be at greater risk

• **Assess for pain of rheumatoid arthritis, osteoarthritis, ankylosing spondylitis;** check ROM, inflammation of joints, characteristics of pain
• Assess ophthalmic patients for pain, inflammation, redness, swelling
• Assess for asthma, aspirin hypersensitivity, nasal polyps; may develop hypersensitivity
• Monitor liver function tests (may be elevated) and uric acid (may be decreased in serum,

increased in urine) periodically; also BUN, creatinine, electrolytes (may be elevated)
- **Serious skin disorders/anaphylaxis:** Assess for rash, if rash develops discontinue immediately, may be fatal
- **Monitor for blood dyscrasias (thrombocytopenia):** bruising, fatigue, bleeding, poor healing; monitor blood counts during therapy; watch for decreasing platelets; if low, therapy may need to be discontinued, restarted after hematologic recovery; stool guaiac
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risks <30 wk, do not use >30 wk, discontinue breastfeeding or product, excreted in breast milk
- **Stroke/MI:** Teach patient to notify prescriber immediately, seek medical attention if chest pain, slurred speech, weakness, shortness of breath occur

### Patient/family education
- Teach patient that product must be continued for prescribed time to be effective; to avoid aspirin, NSAIDs, acetaminophen, or other OTC medications unless approved by prescriber, alcoholic beverages; to contact prescriber before surgery regarding when to discontinue this product
- Teach patient to notify prescriber immediately, stop product if rash occurs
- Caution patient to report bleeding, bruising, fatigue, malaise, since blood dyscrasias do occur
- **Advise patient to report hepatotoxicity:** flulike symptoms, nausea, vomiting, jaundice, pruritus, lethargy
- Instruct patient to use sunscreen to prevent photosensitivity
- Instruct patient to use caution when driving; drowsiness, dizziness may occur
- Teach patient to take with a full glass of water to enhance absorption; remain upright for ½ hr; if dose is missed, take as soon as remembered within 2 hr if taking 1-2 ×/day; do not double doses
- **Gel:** Use dosing card to measure, do not apply where cosmetics, sunscreen have been applied
- **Transdermal:** Not to use in water (swimming/bathing), only use on intact skin, do not cover with occlusive dressing, if peeling occurs, apply adhesive tape or mesh sleeve
- Advise to notify all providers that product is being used
- Teach patient to notify prescriber if pregnancy is planned or suspected
- **Beers:** Avoid chronic use in older adults unless other alternatives are not effective, increased risk of GI bleeding

### Evaluation
**Positive therapeutic outcome**
- Decreased pain in arthritic conditions
- Decreased inflammation in arthritic conditions
- Decreased ocular irritation

D

## RARELY USED

## dicyclomine
(dye-sye'kloe-meen)
**Bentyl, Bentylol, Formulex, Lomine**
*Func. class.:* Gastrointestinal anticholinergic, antispasmodic

**USES:** IBS

**CONTRAINDICATIONS**
Hypersensitivity to anticholinergics, closed-angle glaucoma, GI obstructions, myasthenia gravis, paralytic ileus, GI atony, toxic megacolon, dementia

**DOSAGE AND ROUTES**
**Adult: PO** 10-20 mg tid-qid; **IM** 10-20 mg q4-6hr, 1-2 days **max 160/day**
**Child >2 yr: PO** 10 mg tid-qid
**Child 6 mo-2 yr: PO** 5 mg tid-qid

## didanosine (Rx)
(dye-dan'oh-seen)
**ddI, Pediatric Videx, Videx EC**
*Func. class.:* Antiretroviral
*Chem. class.:* Synthetic purine nucleoside reverse transcriptase inhibitor (NRTI)

**ACTION:** Nucleoside analog incorporating into cellular DNA by viral reverse transcriptase, thereby terminating the cellular DNA chain and preventing viral replication

**Therapeutic outcome:** Antiviral against the retroviruses, primarily HIV-1

**USES:** HIV-1 infection in combination with at least 2 other antiretrovirals

**CONTRAINDICATIONS**
Hypersensitivity, lactic acidosis, pancreatitis, phenylketonuria

**Precautions:** Pregnancy, breastfeeding, children, renal disease, sodium-restricted diets, elevated amylase, preexistent peripheral neuropathy, hyperuricemia, gout, HF, noncirrhotic portal hypertension

**BLACK BOX WARNING:** Hepatic disease, lactic acidosis, pancreatitis

## DOSAGE AND ROUTES

### Ext rel cap

**Adult/adolescent/child ≥6 yr and ≥60 kg:** PO ext rel cap 400 mg daily; if used with tenofovir, reduce to 250 mg daily

**Adult/adolescent/child ≥6 yr and 25 kg to <60 kg:** PO ext rel cap 250 mg daily; if used with tenofovir, reduce to 200 mg daily

**Adolescent 20 kg to <25 kg:** PO ext rel cap 200 mg daily

### Oral dosage (powder for oral solution)

**Adult ≥60 kg:** PO 200 mg bid or 400 mg daily; if used with tenofovir, reduce to 250 mg daily

**Adult <60 kg:** PO 125 mg bid or 250 mg daily; if used with tenofovir, reduce to 200 mg daily

**Adolescent/child/infant >8 mo:** PO 120 mg/m$^2$ q12hr, max adult dosing

**Infant ≤8 mo/neonate ≥2 wk:** PO 100 mg/m$^2$ q12hr for up to 3 months

### Renal dose

**Adult:** PO CrCl ≥60 ml/min: no change

**Adult/adolescent ≥60 kg:** PO CCr 30-59 ml/min: reduce oral solution to 100 mg q12hr or 200 mg q24hr, reduce ext rel capsules to 200 mg daily; CCr 10-29 ml/min: reduce oral solution to 150 mg q24hr, reduce ext rel capsules to 125 mg q24hr; CCr <10 ml/min: reduce oral solution to 100 mg q24hr, reduce ext rel capsules to 125 mg q24hr

**Adult/adolescent <60 kg:** PO CCr 30-59 ml/min: reduce oral solution to 75 mg q12hr or to 150 mg q24hr, reduce ext rel capsules to 125 mg daily; CCr 10-29 ml/min: reduce oral solution to 100 mg q24hr, reduce ext rel capsules to 125 mg daily; CCr <10 ml/min: reduce oral solution to 75 mg q24hr, ext rel capsules are not recommended

### Intermittent hemodialysis/continuous ambulatory peritoneal dialysis

≥60 kg, give 100 mg oral solution or 125 mg ext rel capsules q24hr; <60 kg, give 75 mg oral solution q24hr, ext rel capsules are not recommended

**Available forms:** Powder for oral sol 10 mg/ml; del rel caps 125, 200, 250, 400 mg

### Implementation

- Give on empty stomach 1 hr before or 2 hr after meals q12hr; food decreases effectiveness of product; adjust dose in renal impairment
- Pediatric powder for oral sol should be prepared in the pharmacy; shake before using
- Packets for oral sol must be mixed with ½ glass of water, not fruit juice; stir until dissolved; drink immediately
- Store caps, tabs in tightly closed bottle at room temperature; store oral sol after dissolving at room temperature ≤4 hr
- Do not take dapsone at same time as ddl

## ADVERSE EFFECTS

**CNS:** Peripheral neuropathy, seizures, confusion, *anxiety,* hypertonia, abnormal thinking, asthenia, *insomnia, CNS depression,* pain, dizziness, chills, fever

**CV:** Hypertension, vasodilatation, dysrhythmia, syncope, HF, palpitations

**EENT:** Ear pain, otitis, photophobia, visual impairment, retinal depigmentation, optic neuritis

**GI:** Pancreatitis, *diarrhea, nausea,* vomiting, *abdominal pain,* constipation, stomatitis, dyspepsia, liver abnormalities, flatulence, taste perversion, dry mouth, oral thrush, melena, increased ALT, AST, alkaline phosphatase, amylase, hepatic failure, noncirrhotic portal hypertension

**GU:** Increased bilirubin, uric acid

**HEMA:** Leukopenia, granulocytopenia, thrombocytopenia, anemia

**INTEG:** *Rash, pruritus,* alopecia, ecchymosis, hemorrhage, petechiae, sweating

**MS:** Myalgia, arthritis, myopathy, muscular atrophy

**RESP:** Cough, pneumonia, dyspnea, asthma, epistaxis, hypoventilation, sinusitis

**SYST:** Lactic acidosis, anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed (up to 40%) |
| **Distribution** | Unknown |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys (55%), feces |
| **Half-life** | 48 min, shorter in children |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Up to 1 hr, del rel 2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Allopurinol, tenofovir

**BLACK BOX WARNING:** Increase: fatal lactic acidosis: stavudine, tenofovir, other antiretrovirals, do not use together

Dapsone, ketoconazole: decreased absorption of each specific product

Gatifloxacin, gemifloxacin, grepafloxacin, levofloxacin, lomefloxacin, moxifloxacin, norfloxacin, sparfloxacin, trovafloxacin: Do not use didanosine with these products (PO)
Itraconazole: decreased concentrations
Methadone: decreased didanosine level
Stavudine: increased pancreatitis risk

### Drug classifications

Aluminum, antacids, magnesium: increased side effects
Antiretrovirals, other: decreased concentration
Fluoroquinolones, tetracyclines: decreased concentrations of each specific product

### Drug/food

Do not use with acidic juices
Decreased: absorption 50%, do not use with food

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Pancreatitis:** do not use in those with symptoms of pancreatitis (may be dose-related) or advanced HIV, alcoholism, history of pancreatitis

- **Assess for peripheral neuropathy:** tingling or pain in hands and feet, distal numbness; onset usually occurs 2-6 mo after beginning treatment; if these occur during therapy, product may be decreased or discontinued

**BLACK BOX WARNING: Assess for pancreatitis:** abdominal pain, nausea, vomiting, elevated liver enzymes; product should be discontinued since condition can be fatal

- Assess children by dilated retinal examination q6mo to rule out retinal depigmentation
- Monitor CBC, differential, platelet count monthly, viral load, $CD4^+$ count; notify prescriber of results
- Monitor renal function studies: BUN, serum uric acid, urine CCr before, during therapy; these may be elevated throughout treatment

**BLACK BOX WARNING: Lactic acidosis, severe hepatomegaly, pancreatitis:** assess for abdominal pain, nausea, vomiting, elevated hepatic enzymes; product should be discontinued because condition can be fatal

- Monitor temp; may indicate beginning of infection
- Monitor liver function tests before, during therapy (bilirubin, AST, ALT, amylase, alkaline phosphatase) as needed or monthly
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, product is not recommended in initial treatment due to toxicity, do not breastfeed, enroll in the Antiretroviral Pregnancy Registry 800-258-4263

### Patient/family education

- Advise patient to take on empty stomach, 30 min before or 2 hr after eating; not to mix powder with fruit juice; to drink powder immediately after mixing; to use exactly as prescribed
- Instruct patient to report signs of **infection:** increased temp, sore throat, flulike symptoms; to avoid crowds and those with known infections
- Instruct patient to report signs of **anemia:** fatigue, headache, faintness, shortness of breath, irritability
- Advise patient to report numbness/tingling in extremities
- Instruct patient to report **bleeding;** avoid use of razors and commercial mouthwash
- Advise patient that hair may be lost during therapy; a wig or hairpiece may make patient feel better
- Caution patient to avoid OTC products and other medications without approval of prescriber; to avoid alcohol

**BLACK BOX WARNING: Pancreatitis:** Teach patient to report immediately abdominal pain, diarrhea, nausea, vomiting

- That product does not cure symptoms, only controls them, that infection of others may occur via sex or blood
- Teach patient not to have any sexual contact without use of a condom; needles should not be shared; blood from infected individual should not come in contact with another's mucous membranes
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, product is not recommended in initial treatment due to toxicity, do not breastfeed, enroll if pregnant in the Antiretroviral Pregnancy Registry (800-258-4263)

### Evaluation

#### Positive therapeutic outcome

- Absence of opportunistic infection, symptoms of HIV

## difenoxin with atropine

*See diphenoxylate with atropine*

**⚠ HIGH ALERT**

## digoxin (Rx) NTI

(di-jox′in)

**Digitek, Toloxin**

*Func. class.:* Inotropic antidysrhythmic, cardiac glycoside

*Chem. class.:* Digitalis preparation

**Do not confuse:** Lanoxin/Lasix/Lonox/Lomotil/Xanax/Levoxine

**ACTION:** Inhibits sodium-potassium ATPase, which makes more calcium available for contractile proteins, resulting in increased cardiac output; increases force of contraction (positive inotropic effect); decreases heart rate (negative chronotropic effect); decreases AV conduction speed

**Therapeutic outcome:** Decreased edema, pulse, respiration, crackles

**USES:** Atrial fibrillation

## CONTRAINDICATIONS

Hypersensitivity to digoxin, ventricular fibrillation, ventricular tachycardia, carotid sinus syndrome, 2nd- or 3rd-degree heart block

**Precautions:** Pregnancy, breastfeeding, geriatric, renal disease, acute MI, AV block, severe respiratory disease, hypothyroidism, sinus nodal disease, hypokalemia, electrolyte disturbances, hypertension, cor pulmonale, Wolff-Parkinson-White syndrome

## DOSAGE AND ROUTES

### Loading dose: IV

**Adult: IV** 400-600 mcg as a single dose, effect in 5-30 min, max effect 1-4 hr, give subsequent doses of 100-300 mcg q6-8hr

**Adolescent/child >10 yr: IV** 8-12 mcg/kg, divided into 3 or more doses, with the first dose equaling approximately half of the total, give subsequent doses q4-8hr

**Child 5-10 yr: IV** 15-30 mcg/kg divided into 3 or more doses, with the first dose equaling approximately half of the total, give subsequent doses q4-8hr

**Child 2-4 yr: IV** 25-35 mcg/kg, divided into 3 or more doses, with the first dose equaling approximately half of the total, give subsequent doses q4-8hr

**Child <2 yr/infant: IV** 30-50 mcg/kg, divided into 3 or more doses, with the first dose equaling approximately half of the total, give subsequent doses q4-8hr

**Full-term neonate: IV** 20-30 mcg/kg, divided into 3 or more doses, with the first dose equaling approximately half of the total, give subsequent doses q4-8hr

**Premature neonate: IV** 15-25 mcg/kg, divided into 3 or more doses, with the first dose equaling approximately half of the total, give subsequent doses q4-8hr

### Loading dose: oral dosage (tablets)

Tablets are 60%-80% bioavailable; oral elixir should be used to obtain the appropriate dose in infants, young pediatric patients, or patients with very low body weight

**Adult/adolescent/child >10 yr:** PO Total dose of 10-15 mcg/kg, in 3 divided doses, give half of the total loading dose initially, then one-fourth the loading dose q4-8hr × 2 doses

**Child 5-10 yr:** PO Total dose of 20-45 mcg/kg, in 3 divided doses, give half of the total loading dose initially, then one fourth of the loading dose q4-8hr × 2 doses

### Loading dose: oral dosage (elixir)

Elixir is approximately 70%-85% bioavailable

**Adult/adolescent/child >10 yr:** PO Total dose of 10-15 mcg/kg, give half of the total loading dose initially, then additional fractions of the planned total dose at 4-8 hr

**Child 5-10 yr:** PO Total dose of 20-35 mcg/kg, give half of the total loading dose initially, then additional fractions of the planned total dose at 4-8 hr

**Child 2-4 yr:** PO Total dose of 30-45 mcg/kg, give half of the total loading dose initially, then additional fractions of the planned total dose at 4-8 hr

**Infant/child <2 yr:** PO Total dose of 35-60 mcg/kg, give half of the total loading dose initially then additional fractions of the planned total dose at 4-8 hr

**Full-term neonate:** PO Total dose of 25-35 mcg/kg, give half of the total loading dose initially, then additional fractions of the planned total dose at 4-8 hr

**Premature neonate:** PO Total dose of 20-30 mcg/kg, give half of the total loading dose initially, then additional fractions of the planned total dose at 4-8 hr

### Maintenance dose: IV

**Adult:** IV 125-350 mcg/day, depending on CrCl, daily; usual daily maintenance dose for the HF in adult based on corrected CrCl (ml/min per 70 kg) and lean body weight (LBW) are listed below

- LBW 50-59 kg
  CrCl ≥100 ml/min: 175 mcg IV daily
  CrCl 70-99 ml/min: 150 mcg IV daily
  CrCl 60-69 ml/min: 125 mcg IV daily

- LBW 60-69 kg
  CrCl ≥90 ml/min: 200 mcg IV daily
  CrCl 70-89 ml/min: 175 mcg IV daily
  CrCl 60-69 ml/min: 150 mcg IV daily
- LBW 70-79 kg
  CrCl ≥100 ml/min: 250 mcg IV daily
  CrCl 90-99 ml/min: 225 mcg IV daily
  CrCl 70-89 ml/min: 200 mcg IV daily
  CrCl 60-69 ml/min: 175 mcg IV daily
- LBW 80-89 kg
  CrCl ≥100 ml/min: 275 mcg IV daily
  CrCl 80-99 ml/min: 250 mcg IV daily
  CrCl 70-79 ml/min: 225 mcg IV daily
  CrCl 60-69 ml/min: 200 mcg IV daily
- LBW 90-99 kg
  CrCl ≥90 ml/min: 300 mcg IV daily
  CrCl 80-89 ml/min: 275 mcg IV daily
  CrCl 70-79 ml/min: 250 mcg IV daily
  CrCl 60-69 ml/min: 225 mcg IV daily
- LBW ≥100 kg
  CrCl ≥100 ml/min: 350 mcg IV daily
  CrCl 90-99 ml/min: 325 mcg IV daily
  CrCl 80-89 ml/min: 300 mcg IV daily
  CrCl 70-79 ml/min: 275 mcg IV daily
  CrCl 60-69 ml/min: 250 mcg IV daily

**Full-term neonate to child >10 yr:** 25%-35% of the IV digitalizing dose IV daily

**Preterm neonate:** 20%-30% of the IV digitalizing dose in 2 daily doses

### Maintenance dose: oral dosage (tablets)

**Adult/adolescent/child >10 yr:** PO 3.4-5.1 mcg/kg/day

- LBW 40-49 kg
  CrCl ≥70 ml/min: 187.5 mcg PO daily
  CrCl ≥60-69 ml/min: 125 mcg PO daily
- LBW 50-59 kg
  CrCl ≥90 ml/min: 250 mcg PO daily
  CrCl 60-89 ml/min: 187.5 mcg PO daily
- LBW 60-69 kg
  CrCl ≥100 ml/min: 312.5 mcg PO daily
  CrCl 60-99 ml/min: 250 mcg PO daily
- LBW 70-79 kg
  CrCl ≥80 ml/min: 312.5 mcg PO daily
  CrCl 60-79 ml/min: 250 mcg PO daily
- LBW 80-89 kg
  CrCl ≥90 ml/min: 375 mcg PO daily
  CrCl 60-89 ml/min: 312.5 mcg PO daily
- LBW 90-99 kg
  CrCl ≥90 ml/min: 437.5 mcg PO daily
  CrCl 70-89 ml/min: 375 mcg PO daily
  CrCl 60-69 ml/min: 312.5 mcg PO daily
- LBW ≥100 kg
  CrCl ≥100 ml/min: 500 mcg PO daily
  CrCl 80-99 ml/min: 437.5 mcg PO daily
  CrCl 60-79 ml/min: 375 mcg PO daily

**Child 5-10 yr:** PO 6.4-12.9 mcg/kg/day PO in 2 divided doses is the recommended starting maintenance dose

### Maintenance dose: oral dosage (elixir)

**Adult/adolescent/child >10 yr:** PO 3-4.5 mcg/kg/day daily

- LBW 40-49 kg
  CrCl ≥100 ml/min: 170 mcg PO daily
  CrCl 90-99 ml/min: 160 mcg PO daily
  CrCl 80-89 ml/min: 150 mcg PO daily
  CrCl 70-79 ml/min: 140 mcg PO daily
  CrCl 60-69 ml/min: 130 mcg PO daily
- LBW 50-59 kg
  CrCl ≥100 ml/min: 213 mcg PO daily
  CrCl 90-99 ml/min: 200 mcg PO daily
  CrCl 80-89 ml/min: 188 mcg PO daily
  CrCl 70-79 ml/min: 175 mcg PO daily
  CrCl 60-69 ml/min: 163 mcg PO daily
- LBW 60-69 kg
  CrCl ≥100 ml/min: 255 mcg PO daily
  CrCl 90-99 ml/min: 240 mcg PO daily
  CrCl 80-89 ml/min: 225 mcg PO daily
  CrCl 70-79 ml/min: 210 mcg PO daily
  CrCl 60-69 ml/min: 195 mcg PO daily
- LBW 70-79 kg
  CrCl ≥100 ml/min: 298 mcg PO daily
  CrCl 90-99 ml/min: 280 mcg PO daily
  CrCl 80-89 ml/min: 263 mcg PO daily
  CrCl 70-79 ml/min: 245 mcg PO daily
  CrCl 60-69 ml/min: 228 mcg PO daily
- LBW 80-89 kg
  CrCl ≥100 ml/min: 340 mcg PO daily
  CrCl 90-99 ml/min: 320 mcg PO daily
  CrCl 80-89 ml/min: 300 mcg PO daily
  CrCl 70-79 ml/min: 280 mcg PO daily
  CrCl 60-69 ml/min: 260 mcg PO daily
- LBW 90-99 kg
  CrCl ≥100 ml/min: 383 mcg PO daily
  CrCl 90-99 ml/min: 360 mcg PO daily
  CrCl 80-89 ml/min: 338 mcg PO daily
  CrCl 70-79 ml/min: 315 mcg PO daily
  CrCl 60-69 ml/min: 293 mcg PO daily
- LBW ≥100 kg
  CrCl ≥100 ml/min: 425 mcg PO daily
  CrCl 90-99 ml/min: 400 mcg PO daily
  CrCl 80-89 ml/min: 375 mcg PO daily
  CrCl 70-79 ml/min: 350 mcg PO daily
  CrCl 60-69 ml/min: 325 mcg PO daily

**Child 5-10 yr:** PO 5.6-11.3 mcg/kg/day in 2 divided doses

**Child 2-4 yr:** PO 9.4-13.1 mcg/kg/day in 2 divided doses

**Child <2 yr/infant:** PO 11.3-18.8 mcg/kg/day in 2 divided doses

**Full-term neonate:** PO 7.5-11.3 mcg/kg/day in 2 divided doses

**Preterm neonate:** PO 4.7-7.8 mcg/kg/day in 2 divided doses

## Renal dose

### IV route

- CrCl 50-59 ml/min
  LBW 50-59 kg: 125 mcg IV once daily
  LBW 60-69 kg: 150 mcg IV once daily
  LBW 70-79 kg: 175 mcg IV once daily
  LBW 80-89 kg: 200 mcg IV once daily
  LBW 90-99 kg: 225 mcg IV once daily
  LBW ≥100 kg: 250 mcg IV once daily
- CrCl 40-49 ml/min
  LBW 50-59 kg: 100 mcg IV once daily
  LBW 60-69 kg: 125 mcg IV once daily
  LBW 70-79 kg: 150 mcg IV once daily
  LBW 80-89 kg: 175 mcg IV once daily
  LBW 90-99 kg: 200 mcg IV once daily
  LBW ≥100 kg: 225 mcg IV once daily
- CrCl 30-39 ml/min
  LBW 50-59 kg: 100 mcg IV once daily
  LBW 60-69 kg: 125 mcg IV once daily
  LBW 70-89 kg: 150 mcg IV once daily
  LBW 90-99 kg: 175 mcg IV once daily
  LBW ≥100 kg: 200 mcg IV once daily
- CrCl 20-29 ml/min
  LBW 50-69 kg: 100 mcg IV once daily
  LBW 70-79 kg: 125 mcg IV once daily
  LBW 80-99 kg: 150 mcg IV once daily
  LBW ≥100 kg: 175 mcg IV once daily
- CrCl 10-19 ml/min
  LBW 50-59 kg: 75 mcg IV once daily
  LBW 60-79 kg: 100 mcg IV once daily
  LBW 80-89 kg: 125 mcg IV once daily
  LBW ≥90 kg: 150 mcg IV once daily
- CrCl <10 ml/min
  LBW 50-69 kg: 75 mcg IV once daily
  LBW 70-89 kg: 100 mcg IV once daily
  LBW 90-99 kg: 125 mcg IV once daily
  LBW ≥100 kg: 150 mcg IV once daily

## Oral dosage (tablets)

- CrCl 40-59 ml/min
  LBW 50-69 kg: 187.5 mcg PO once daily
- CrCl 50-59 ml/min
  LBW 70-89 kg: 250 mcg PO once daily
  LBW ≥90 kg: 312.5 mcg PO once daily
- CrCl 30-39 ml/min
  LBW 50-59 kg: 125 mcg PO once daily
  LBW 60-79 kg: 187.5 mcg PO once daily
  LBW 80-99 kg: 250 mcg PO once daily
  LBW ≥100 kg: 312.5 mcg PO once daily
- CrCl 20-29 ml/min
  LBW 50-69 kg: 125 mcg PO once daily
  LBW 70-89 kg: 187.5 mcg PO once daily
  LBW ≥90 kg: 250 mcg PO once daily
- CrCl <20 ml/min
  LBW 50-69 kg: 125 mcg PO once daily
  LBW 70-99 kg: 187.5 mcg PO once daily
  LBW ≥100 kg: 250 mcg PO once daily

## Oral dosage (elixir)

- CrCl 50-59 ml/min
  LBW 50-59 kg: 150 mcg PO once daily
  LBW 60-69 kg: 180 mcg PO once daily
  LBW 70-79 kg: 210 mcg PO once daily
  LBW 80-89 kg: 240 mcg PO once daily
  LBW 90-99 kg: 270 mcg PO once daily
  LBW ≥100 kg: 300 mcg PO once daily
- CrCl 40-49 ml/min
  LBW 50-59 kg: 138 mcg PO once daily
  LBW 60-69 kg: 165 mcg PO once daily
  LBW 70-79 kg: 193 mcg PO once daily
  LBW 80-89 kg: 220 mcg PO once daily
  LBW 90-99 kg: 248 mcg PO once daily
  LBW ≥100 kg: 275 mcg PO once daily
- CrCl 30-39 ml/min
  LBW 50-59 kg: 125 mcg PO once daily
  LBW 60-69 kg: 150 mcg PO once daily
  LBW 70-79 kg: 175 mcg PO once daily
  LBW 80-89 kg: 200 mcg PO once daily
  LBW 90-99 kg: 225 mcg PO once daily
  LBW ≥100 kg: 250 mcg PO once daily
- CrCl 20-29 ml/min
  LBW 50-59 kg: 113 mcg PO once daily
  LBW 60-69 kg: 135 mcg PO once daily
  LBW 70-79 kg: 158 mcg PO once daily
  LBW 80-89 kg: 180 mcg PO once daily
  LBW 90-99 kg: 203 mcg PO once daily
  LBW ≥100 kg: 225 mcg PO once daily
- CrCl <20 ml/min
  LBW 50-59 kg: 100 mcg PO once daily
  LBW 60-69 kg: 120 mcg PO once daily
  LBW 70-79 kg: 140 mcg PO once daily
  LBW 80-89 kg: 160 mcg PO once daily
  LBW 90-99 kg: 180 mcg PO once daily
  LBW ≥100 kg: 200 mcg PO once daily

The daily maintenance dose can also be estimated using the patient's CrCl and loading dose (LD) according to the method of Jelliffe and Brooker daily % loss = 14 + CrCl/5

**Available forms:** Caps 0.05, 0.1, 0.2 mg; elix 0.05 mg/ml; tabs 0.125, 0.25, 0.5, 0.0625, 0.1875 mg; inj 0.5 ✱, 0.25 mg/ml; pediatric inj 0.1 mg/ml

## Implementation

- Do not give at same time as antacids or other products that decrease absorption

**PO route**

- Bioavailability varies between different oral dosage forms of digoxin and between different brands of the same dosage form. Changing from one preparation to another may require dosage adjustments.
- All dosage forms may be administered without regard to meals.

• Tab may be crushed and administered with food or fluids
• Pediatric elixir should be administered using a calibrated measuring device

**Injectable routes**
• When changing from PO to IM/IV use 20%-25% less
• IV is preferred over IM, as it is less painful
• PO should replace parenteral therapy as soon as possible
• Visually inspect parenteral products for particulate matter and discoloration prior to use

**IV route**
• Monitor ECG during and for 6 hr after IV use, watch for dysrhythmias, or bradycardia, notify prescriber
• May be given undiluted or each 1 ml may be diluted in 4 ml of sterile water for injection, NS, $D_5W$, or LR; diluent volumes less than 4 ml will cause precipitation; use diluted solutions immediately
• Inject over at least 5 min via Y-site or 3-way stopcock; in patients with pulmonary edema, administer over 10-15 min to avoid inadvertent overdosage, do not flush the syringe following administration
• Check for potency and site for redness, inflammation, infiltration, tissue sloughing can occur

**IM route**
• Do not administer more than 2 ml at any one IM injection site
• Inject deeply into gluteal muscle, then massage area

**Y-site compatibilities:** Amrinone, ciprofloxacin, cisatracurium, dilTIAZem, famotidine, meperidine, meropenem, midazolam, milrinone, morphine, potassium chloride, propofol, remifentanil, tacrolimus, vit B/C

**Y-site incompatibilities:** Fluconazole, foscarnet

**Additive compatibilities:** Bretylium, cimetidine, furosemide, lidocaine, raNITIdine, verapamil

**Additive incompatibility:** DOBUTamine

## ADVERSE EFFECTS

**CNS:** *Headache,* drowsiness, apathy, confusion, disorientation, fatigue, depression, hallucinations

**CV:** Dysrhythmias, hypotension, bradycardia, AV block

**EENT:** Blurred vision, yellow-green halos, photophobia, diplopia

**GI:** Nausea, vomiting, anorexia, abdominal pain, diarrhea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Widely distributed; 20%-25% protein bound |
| **Metabolism** | Liver, small amount; also intestinal bacteria |
| **Excretion** | Urine |
| **Half-life** | 30-40 hr |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | ½-1½ hr | 5-30 min |
| **Peak** | 2-6 hr | 1-4 hr |
| **Duration** | After steady state | 2-6 days |

## INTERACTIONS

### Individual drugs

AMILoride, cholestyramine, colestipol, metoclopramide, thyroid hormones: decreased digoxin levels
Amiodarone, dilTIAZem, indomethacin, NIFEdipine, propantheline, quiNIDine, verapamil: increased digoxin levels
Amphotericin B, carbenicillin, ticarcillin: increased hypokalemia, increased toxicity
Calcium IV: increased hypercalcemia, hypomagnesemia, digoxin toxicity, monitor electrolytes
Kaolin/pectin: decreased absorption

### Drug classifications

Antacids: decreased digoxin absorption
Anticholinergics: increased digoxin blood levels
Antidysrhythmics, β-adrenergic blockers: increased bradycardia
Azole antifungals, macrolides, tetracyclines: increased toxicity, monitor for toxicity
Diuretics (thiazide) corticosteroids: increased hypokalemia, hypercalcemia, hypomagnesemia, digoxin toxicity
Sympathomimetics: increased cardiac dysrhythmia risk

### Drug/herb

Increase: Cardiac effects: foxglove, golden seal, hawthorn, rue
St. John's wort: decreased product effect

### Drug/food

Flaxseed, psyllium: decreased digoxin effect: food, separate by ≥1 hr absorption

### Drug/lab test

Increased: CPK

## NURSING CONSIDERATIONS

### Assessment

• Assess and document apical pulse for 1 min before giving product; if pulse <60 in adult or <90 in an infant or is significantly different, take again in 1 hr; if <60 in adult, call prescriber; note rate, rhythm, character, monitor I&O, daily weight, check for edema
• **Monitor electrolytes:** potassium, sodium, chloride, magnesium, calcium; renal function studies: BUN, creatinine; other blood studies: ALT, AST, bilirubin, Hct, Hgb, product levels (therapeutic level 0.5-2 ng/ml) before initiating treatment and periodically thereafter, draw ≥ 6-8 hr after last dose, optimally 12-24 hr after a dose, monitor for decreased potassium, or increased potassium
• Monitor resolution of atrial dysrhythmias by ECG; if tachydysrhythmia develops, hold product; delay cardioversion while product levels are determined
• Monitor ECG continuously during parenteral loading doses and for patients with suspected toxicity; provide hemodynamic monitoring for patients with heart failure or administer multiple cardiac products
• **Beers:** Avoid dosage >0.125 mg/dl in atrial fibrillation, heart failure in older adults; decreased renal clearance may lead to toxicity
• **Pregnancy/breastfeeding:** No well-controlled studies, use only if clearly needed, excreted in breast milk (small amounts), may breastfeed

### Patient/family education

• Advise patient not to stop abruptly; teach all aspects of product
• Caution patient to avoid OTC medications including cough, cold, allergy preparations, antacids, since many adverse product interactions may occur; do not take antacid at same time or within 2 hr of this product
• Instruct patient to notify prescriber of any loss of appetite, lower stomach pain, diarrhea, weakness, drowsiness, headache, blurred or yellow-green vision, rash, depression; teach toxic symptoms of this product and when to notify prescriber
• Advise patient to maintain a sodium-restricted diet as ordered; to take potassium supplements as ordered to prevent toxicity
• Instruct patient to report shortness of breath, difficulty breathing, weight gain, edema, persistent cough
• Teach patient purpose of product is to regulate the heart's functioning
• Teach patient as outpatient to check and record pulse for 1 min before taking dose; if there is a change of >15 bpm from usual pulse, prescriber should be notified
• Teach patient to take medication at the same time each day, take missed doses within 12 hr; do not double doses; notify prescriber if doses are missed for 2 days or more; how to monitor heart rate
• Teach patient toxic symptoms and when to notify prescriber
• Advise patient to carry/wear emergency ID describing dosage and reason for digoxin
• Advise patient to use one brand consistently, to keep in original container
• Teach patient how to take pulse, when to notify prescriber
• Teach patient to notify prescriber if pregnancy is planned or suspected
• Teach patient to carry ID stating condition treated, products taken

### Evaluation

**Positive therapeutic outcome**
• Decreased in heart failure, dysrhythmias
• Serum digoxin level 0.5-2 ng/ml

## TREATMENT OF OVERDOSE:

Discontinue product, administer potassium, monitor ECG, administer an adrenergic blocking agent, digoxin immune FAB

## dihydroergotamine

*See ergotamine*

**⚠ HIGH ALERT**

## dilTIAZem (Rx)

(dil-tye'a-zem)
**Apo-Diltiaz, Cardizem, Cardizem CD, Cardizem LA, Cartia XT, Dilacor-XR, Dilt-CD, Diltia XR, Diltia XT, Diltzac, Taztia XT, Tiamate, Tiazac**
*Func. class.:* Calcium channel blocker, antianginal, antiarrhythmic class IV, antihypertensive
*Chem. class.:* Benzothiazepine

**Do not confuse:** Cardizem/Cardene Tiazac/Ziac

**ACTION:** Inhibits calcium ion influx across cell membrane during cardiac depolarization, produces relaxation of coronary vascular smooth muscle, dilates coronary arteries, slows SA/AV node conduction times, dilates peripheral arteries

**Therapeutic outcome:** Decreased angina pectoris, dysrhythmias, B/P

## USES

**Oral:** Angina pectoris due to hypertension, coronary artery spasm, improvement in exercise tolerance (chronic stable angina)

**Parenteral:** Atrial fibrillation, flutter; paroxysmal supraventricular tachycardia

## CONTRAINDICATIONS

Sick sinus syndrome, 2nd- or 3rd-degree heart block, hypotension less than 90 mm Hg systolic, acute MI, pulmonary congestion, cardiogenic shock

**Precautions:** Pregnancy, breastfeeding, children, HF, aortic stenosis, bradycardia, GERD, hepatic disease, hiatal hernia, ventricular dysfunction, elderly

## DOSAGE AND ROUTES

### Hypertension

**Adult:** PO 30 mg TID, increase to max 480 mg/day; EXT REL 120-240 mg qday, max 540 mg/day; SUS REL 60 mg bid, max 360 mg/day

### Prinzmetal's or variant angina, chronic stable angina

**Adult:** PO 30 mg qid, increasing dose gradually to 180-360 mg/day in divided doses or EXT REL (LA, CD, XT, XR products) 180-360 mg, max 480-540 mg/day, depending on brand

### Atrial fibrillation, flutter, paroxysmal supraventricular tachycardia

**Adult:** **IV** 0.25 mg/kg as BOL over 2 min initially, then 0.35 mg/kg may be given after 15 min; if no response, may give CONT INF 5-15 mg/hr for up to 24 hr

**Available forms:** Tabs 30, 60, 90, 120 mg; ext rel tab 120, 180, 240, 300, 360, 420 mg; ext rel caps 60, 90, 120, 180, 240, 300, 360, 420 mg; inj 5 mg/ml (5, 10 ml); powder for inj 100 mg

### Implementation

**PO route**

- Not all products are interchangeable
- Store at room temperature
- **Cardiazem LA ext rel tab 24 hr:** give daily, either AM or PM, without regard to meals
- **Dilacor XR/Diltia XT ext rel cap 24 hr** give daily, take on empty stomach, swallow whole, do not cut, crush, chew, open
- **Tiazac, Tiztia XT:** give daily without regard to meals
- **Conventional regular-rel tab:** give before meals and at bedtime
- **Cardizem CD or equivalent (Cartia XT) generic ext rel cap 24 hr:** give daily, without regard to meals
- Give with meals for GI symptoms; may crush and sprinkle (reg tab) on applesauce

**Direct IV route**

- Give direct **IV** undiluted over 2 min

**Continuous IV infusion route**

- **Dilute** 125 mg/100 ml (1.25 mg/ml) or 250 mg/250 ml (1 mg/ml) or 250 mg/500 ml (0.5 mg/ml) of $D_5W$, 0.9% NaCl, $D_5$/0.45% NaCl; give 10 mg/hr; may increase by 5 mg/hr to 15 mg/hr; may continue inf up to 24 hr max

**Y-site compatibilities:** Albumin, amikacin, amphotericin B, aztreonam, bretylium, bumetanide, ceFAZolin, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, cefTRIAXone, cefuroxime, cimetidine, ciprofloxacin, clindamycin, digoxin, DOBUTamine, DOPamine, doxycycline, EPINEPHrine, erythromycin, esmolol, fentaNYL, fluconazole, gentamicin, hetastarch, HYDROmorphone, imipenem-cilastatin, labetalol, lidocaine, LORazepam, meperidine, metoclopramide, metroNIDAZOLE, midazolam, milrinone, morphine, multivitamins, niCARdipine, nitroglycerin, norepinephrine, oxacillin, penicillin G potassium, pentamidine, piperacillin, potassium chloride, potassium phosphates, raNITIdine, sodium nitroprusside, theophylline, ticarcillin, ticarcillin/clavulanate, tobramycin, trimethoprim-sulfamethoxazole, vancomycin, vecuronium

## ADVERSE EFFECTS

**CNS:** *Headache, fatigue, drowsiness,* dizziness, depression, weakness, insomnia, tremor, paresthesia
**CV:** Dysrhythmia, *edema,* HF, bradycardia, hypotension, palpitations, heart block
**GI:** *Nausea,* vomiting, diarrhea, gastric upset, *constipation,* increased LFTs
**GU:** Nocturia, polyuria, acute renal failure
**INTEG:** *Rash,* pruritus at inj site, flushing, photosensitivity, burning, Stevens-Johnson syndrome
**RESP:** Rhinitis, dyspnea, pharyngitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Not known |
| **Metabolism** | Liver, extensively |
| **Excretion** | Metabolites (96%) |
| **Half-life** | 3½-9 hr |

### Pharmacodynamics

| | PO | PO–sus rel | IV |
|---|---|---|---|
| **Onset** | ½ hr | Unknown | Unknown |
| **Peak** | 2-3 hr | Unknown | Unknown |
| **Duration** | 6-8 hr | 11-18 hr | Unknown |

## INTERACTIONS

### Individual drugs

CarBAMazepine, lithium, methylPREDNISolone: increased effects of each specific product, monitor for increased action of each product

Cimetidine: increased AV node slowing
CycloSPORINE: increased cycloSPORINE effect
Digoxin: increased digoxin effect
Theophylline, lithium: increased effect, toxicity

### Drug classifications

Anesthetics: increased effects of anesthetics
β-Adrenergic blockers: increased bradycardia, HF, increased β-blocker effect
NSAIDs, PHENobarbital, phenytoin: decrease: Antihypertensive effect
Benzodiazepines: increased effect of benzodiazepines
HMG-CoA reductase inhibitors: increased effects

### Drug/food

Increase: dilTIAZem effect, grapefruit juice, avoid use

## NURSING CONSIDERATIONS

### Assessment

- **HF:** monitor for dyspnea, weight gain, edema, jugular vein distention, rales; monitor I&O ratios daily, weight
- **Angina:** location, duration, alleviating factors, activity when pain starts
- **Dysrhythmias:** monitor B/P and pulse, respiration, ECG and intervals (PR, QRS, QT); PCWP, CVP often during infusion; if B/P drops 30 mm Hg, stop infusion and call prescriber, monitor B/P, ECG continuously if using IV, report bradycardia, have emergency equipment nearby
- **Beers:** Avoid extended-release capsule in older adults, promotes fluid retention, exacerbates heart failure
- **Pregnancy:** Identify if pregnancy is planned or suspected or if breastfeeding, use only if benefits outweigh fetal risk
- **Stevens-Johnson syndrome:** Assess for rash, fever, fatigue, mouth blistering, discontinue product

### Patient/family education

- Caution patient to avoid hazardous activities until stabilized on product and dizziness is no longer a problem
- Instruct patient to limit caffeine consumption; to avoid grapefruit juice; to avoid alcohol and OTC products unless directed by prescriber
- Tell patient to comply in all areas of medical regimen; diet, exercise, stress reduction, product therapy; to notify prescriber of irregular heartbeat, shortness of breath, swelling of feet and hands, pronounced dizziness, constipation, nausea, hypotension
- Teach patient to use sunscreen, protective clothing to prevent photosensitivity
- Teach patient to use as directed even if feeling better; may be taken with other cardiovascular products (nitrates, β-blockers); how to take pulse, B/P before taking product; to change position slowly
- Teach patient not to discontinue abruptly
- **Pregnancy:** Teach patient to avoid pregnancy and breastfeeding

### Evaluation

#### Positive therapeutic outcome

- Decreased anginal pain
- Decreased B/P
- Increased exercise tolerance
- Absence of dysrhythmias

## TREATMENT OF OVERDOSE:

Atropine for AV block, vasopressor for hypotension

## dimenhyDRINATE (OTC, Rx)

(dye-men-hye′dri-nate)
**Anti-Nauseant, Dirate, Dramamine, Driminate, TripTone, Wal-Dram**
*Func. class.:* Antiemetic, antihistamine, anticholinergic
*Chem. class.:* H1-receptor antagonist, ethanolamine derivative

**Do not confuse:** dimenhyDRINATE/diphenhydrAMINE

**ACTION:** Competes with histamine for H1 receptors in GI tract, blood vessels, respiratory tract; central anticholinergic activity, which results in decreased vestibular stimulation and blockade of chemoreceptor trigger zone

**Therapeutic outcome:** Absence of nausea, vomiting, or vertigo

**USES:** Motion sickness, nausea, vomiting, vertigo

**Unlabeled uses:** Hyperemesis gravidarum, Ménière's syndrome

## CONTRAINDICATIONS

Hypersensitivity, infants, neonates, tartrazine dye hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, geriatric patients, cardiac dysrhythmias, asthma, prostatic hypertrophy, bladder-neck obstruction, closed-angle glaucoma, stenosing peptic ulcer, pyloroduodenal obstruction

## DOSAGE AND ROUTES

**Adult:** PO 50-100 mg q4hr; IM/IV 50 mg q4hr as needed (Canada only)
**Child 6-12 yr:** PO 25-50 mg q6-8hr prn, max 150 mg/day
**Child 2-5 yr:** PO 12.5-25 mg q6-8hr, max 75 mg/day

**Available forms:** Tabs 50 mg; inj 50 mg/ml; elixir 15 mg/5 ml; chew tabs 50 mg

### Implementation

- Give IM inj in large muscle mass; aspirate to avoid IV administration (Canada only)
- Tablets may be swallowed whole, chewed, or allowed to dissolve

**IV route (Canada only)**
- After diluting 50 mg/10 ml of NaCl inj, give 50 mg over 2 min

## ADVERSE EFFECTS

**CNS:** Drowsiness, restlessness, headache, dizziness, insomnia, confusion, nervousness, tingling, vertigo
**CV:** Hypertension, hypotension, palpitation
**EENT:** Dry mouth, blurred vision, diplopia, nasal congestion, photosensitivity, xerostomia
**GI:** Nausea, anorexia, vomiting, constipation
**INTEG:** Rash, urticaria, fever, chills, flushing
**MISC:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | May cross placenta, enter breast milk |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | PO 15-30 min |
| **Peak** | PO 2 hr |
| **Duration** | PO 4-6 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased effects

### Drug classifications

Anticholinergics, tricyclics, MAOIs, opiates, sedative/hypnotics, other CNS depressants: increased effects

### Drug/lab test

False negative: allergy skin testing

## NURSING CONSIDERATIONS

### Assessment

- Monitor VS, B/P; check patients with cardiac disease more often
- **Assess for signs of toxicity of other products or masking of symptoms of disease:** brain tumor, intestinal obstruction
- Observe for drowsiness, dizziness
- **Pregnancy/breastfeeding:** Use only if clearly needed, no well-controlled studies, do not breastfeed, excreted in breast milk

### Patient/family education

- Advise patient to avoid hazardous activities, activities requiring alertness because dizziness may occur; to request assistance with ambulation
- Advise to avoid alcohol, other CNS depressants
- **Beers:** Avoid use in older adults, highly anticholinergic

### Evaluation

**Positive therapeutic outcome**
- Absence of nausea, vomiting, or vertigo

## dinoprostone (Rx)

(dye-noe-prost'one)
**Cervidil, Prepidil, Prostin E-Z**
*Func. class.:* Oxytocic, abortifacient
*Chem. class.:* Prostaglandin $E_2$

**Do not confuse:** Prepidil/bepridil

**ACTION:** Stimulates uterine contractions similar to labor by myometrium stimulation, causing abortion; acts within 30 hr for complete abortion

**Therapeutic outcome:** Beginning of labor, fetal expulsion

**USES:** Abortion during 2nd trimester, benign hydatidiform mole, expulsion of uterine contents in fetal deaths to 28 wk, missed abortion, cervical effacement and dilatation in term pregnancy when they have not occurred spontaneously

## CONTRAINDICATIONS

Hypersensitivity, C-section, surgery, fetal distress, multiparity, vaginal bleeding, cephalopelvic disproportion

**Precautions:** Pregnancy, renal/hepatic/ cardiac disease, asthma, anemia, jaundice, diabetes mellitus, seizure disorders, hypertension, glaucoma, uterine fibrosis, cervical stenosis, pelvic surgery, PID, respiratory disease

**BLACK BOX WARNING:** Requires a specialized setting and an experienced clinician

## DOSAGE AND ROUTES

### Abortifacient/2nd trimester/missed abortion/benign hydatidiform mole/intrauterine fetal death

**Adult:** VAG SUPP 20 mg; repeat q3-5hr until abortion occurs; max dose 240 mg

### Cervical ripening

**Adult:** GEL 0.5 mg vag gel placed in cervical canal, may repeat after 6 hr, max 1.5 mg/24 hr; vag insert 10 mg high in vagina, remove at onset of active labor or within 12 hr

**Available forms:** Vag supp 20 mg; gel 0.5 mg/3 g (prefilled syringe); vag insert 10 mg

### Implementation

**Suppository route**

- Warm supp by running warm water over package; insert high in vagina, wear gloves to prevent absorption; have patient recumbent for at least 10 min

**Gel route**

- Do not allow to come in contact with skin; use soap and water to wash after use
- Gel should be at room temperature
- Place patient in dorsal or lithotomy position to insert gel into cervical canal; remove catheter; discard all items after use; keep supine 15-30 min

## ADVERSE EFFECTS

**CNS:** *Headache,* dizziness, chills, fever, flushing
**CV:** Hypotension, dysrhythmias, DIC
**EENT:** Blurred vision
**GI:** *Nausea, vomiting, diarrhea*
**GU:** Vaginitis, vaginal pain, vulvitis, vaginismus
**INTEG:** Rash, skin color changes
**MS:** *Leg cramps, joint swelling,* weakness
**SYST:** Anaphylactoid syndrome of pregnancy
**Insert:** Uterine hyperstimulation, fever, nausea, vomiting, diarrhea, abdominal pain
**Gel:** Uterine contractile abnormality, GI side effects, back pain, fever, amniotic fluid embolism
**Fetal:** Bradycardia (i.e., deceleration)
**Suppository:** Uterine rupture, anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Enzymes |
| **Excretion** | Kidneys |
| **Half-life** | Unknown |

### Pharmacodynamics

| | Gel | Supp |
|---|---|---|
| **Onset** | Rapid | 10 min |
| **Peak** | 30-45 min | Unknown |
| **Duration** | Unknown | 2-3 hr |

## INTERACTIONS

### Individual drugs

### Drug classifications

Other oxytocics: increased effect

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Specialized setting, specialized clinician:** use only with emergency equipment nearby, by a clinician experienced with use in pregnancy termination; complete abortion should result within 17 hr (insert), use only in 12-20 wk or up to 28 wk for removal of remaining material after miscarriage

- **Abortifacient: Monitor contractions for frequency, duration**
- **Anaphylaxis: Monitor for rash, wheezing**
- **Cervical ripening:** assess dilation and effacement of the cervix, uterine contractions, fetal heart tones; watch for contractions lasting over 1 min, hypertonus, fetal distress; product should be slowed or discontinued
- Assess for fever that occurs approximately 30 min after supp insertion (abortion)
- Monitor for nausea, vomiting, diarrhea; these may require medication
- **Assess for hypersensitivity reaction:** dyspnea, rash, chest discomfort
- Assess respiratory rate, rhythm, depth; notify prescriber of abnormalities in pulse, B/P
- **Check amount of vaginal discharge;** itching, irritation indicates vaginal infection

### Patient/family education

- Teach patient all aspects of treatment including purpose of medication and expected results
- Tell patient that gel may produce warmth in her vagina
- Caution patient that if contractions are longer than 1 min to notify nurse or prescriber
- Advise patient to notify prescriber of cramping, pain, increased bleeding, chills, increased temp, or foul-smelling discharge; these symptoms may indicate uterine infection
- Advise patient to remain supine 10-15 min after insertion of suppository, 2 hr after insert, 15-30 min after gel

### Evaluation

**Positive therapeutic outcome**

- Progression of labor
- Abortion

## diphenhydrAMINE (OTC, Rx)

(dye-fen-hye′dra-meen)

**Allerdryl, Allergy formula, AllerMax, Altaryl, Banophen, Benadryl, Benadryl Allergy, Benadryl Allergy Dye Free, Benadryl Children's Allergy, Benylin, Buckley's Bedtime, Diphedryl, Diphenhist, Calmex, Dormex, Dytan, ElixSure Allergy, Equaline Allergy, Equaline Children's Allergy, Nadryl, Nytol, PediaCare Children's Allergy, PediaCare Nighttime Cough, Q-Dryl Allergy, Select Brand Allergy, Siladryl, Silphen, Simply Sleep, Sleepinal, Sleep Tabs, Sominex, Unisom, Valu-Dryl, Wal-dryl Allergy, Wal-dryl Allergy Dye Free, Wal-dryl Children's Allergy, ZzzQuil**

*Func. class.:* Antihistamine (1st generation, nonselective), antitussive

*Chem. class.:* Ethanolamine derivative, $H_1$-receptor antagonist

**Do not confuse:** diphenhydrAMINE/dicyclomine/dimenhyDRINATE

**ACTION:** Acts on blood vessels, GI, respiratory system by competing with histamine for $H_1$-receptor site; decreases allergic response by blocking histamine

**Therapeutic outcome:** Absence of allergy symptoms and rhinitis, decreased dystonic symptoms, absence of motion sickness, absence of cough, ability to sleep

**USES:** Allergy symptoms, rhinitis, motion sickness, antiparkinsonism, nighttime sedation, infant colic, nonproductive cough, insomnia in children

## CONTRAINDICATIONS

Hypersensitivity to $H_1$-receptor antagonist, neonates

**Precautions:** Pregnancy, breastfeeding, children <6 yr, increased intraocular pressure, renal/cardiac disease, hypertension, bronchial asthma, seizure disorder, stenosed peptic ulcers, hyperthyroidism, prostatic hypertrophy, bladder neck obstruction

## DOSAGE AND ROUTES

**Adult and child >12 yr:** PO 25-50 mg q4-6hr, max 300 mg/day; IM/**IV** 10-50 mg, max 300 mg/day

**Child 6-12 yr:** PO/IM/**IV** 5 mg/kg/day in 4 divided doses, max 300 mg/day

### Nighttime sleep aid

**Adult and child ≥12 yr:** PO 25-50 mg at bedtime

### Antitussive (syrup only)

**Adult and child ≥12 yr:** 25 mg q4hr, max 150 mg/24 hr

**Child 6-12 yr:** 12.5 mg q4hr, max 75 mg/24 hr

**Available forms:** Caps 25, 50 mg; tabs 25, 50 mg; chew tabs 12.5, 25 mg; elix 12.5 mg/5 ml; syr 12.5 mg/5 ml; inj 50 mg/ml; orally disintegrating tabs 12.5 mg; orally disintegrating strips 12.5, 25 mg

### Implementation

- Avoid use in children <6 yr, death has occurred; overdose has occurred in topical gel taken orally (adult/child)
- Give 20 min before bedtime if using for sleep aid

**PO route**

- Give with meals if GI symptoms occur; absorption rate may be slightly decreased; cap may be opened and product mixed with food/fluids for patients with swallowing difficulties

**IM route**

- Give IM inj in large muscle mass; aspirate to avoid **IV** administration; rotate sites

**Direct IV route**

- Give **IV** undiluted ≤25 mg/min

**Intermittent IV infusion route**

May be diluted with 0.9% NaCl, $D_5W$, $D_{10}W$, 0.45% NaCl, $D_5$/0.9% NaCl, $D_5$/0.45% NaCl, $D_5$/0.25% NaCl, LR, Ringer's; give 25 mg/min or less

**Y-site compatibilities:** Acetaminophen, aldesleukin, alfentanil hydrochloride, amifostine, amikacin sulfate, aminocaproic acid, amphotericin B lipid complex (Abelcet), amphotericin B liposome (AmBisome), amsacrine, anidulafungin, argatroban, ascorbic acid injection, atenolol, atracurium besylate, atropine sulfate, azithromycin, benztropine mesylate, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, cefTAZidime, ceftizoxime, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, cladribine, clindamycin, codeine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, digoxin, dilTIAZem, DOBUTamine, DOCEtaxel, DOPamine, doripenem, doxacurium, DOXOrubicin, DOXOrubicin liposomal, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, epoetin alfa, eptifibatide, ertapenem,

erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, folic acid, gallium, gatifloxacin, gemcitabine, gemtuzumab, gentamicin, glycopyrrolate, granisetron, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, irinotecan, isoproterenol, labetalol, levofloxacin, lidocaine, linezolid, LORazepam, LR, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, meropenem, metaraminol, methadone, methicillin, methotrexate, methoxamine, methyldopate, metoclopramide, metoprolol, metroNIDAZOLE, miconazole, midazolam, minocycline, mitoXANTRONE, morphine, multiple vitamins injection, mycophenolate, nalbuphine, naloxone, nesiritide, netilmicin, nitroglycerin, norepinephrine, octreotide, ondansetron, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, papaverine, PEMEtrexed, penicillin G potassium/sodium, pentamidine, pentazocine, phenylephrine, phytonadione, piperacillin, piperacillin-tazobactam, polymyxin B, potassium chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, pyridoxine, quiNIDine, quinupristin-dalfopristin, raNITIdine, remifentanil, Ringer's, ritodrine, riTUXimab, rocuronium, sargramostim, sodium acetate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA, tobramycin, tolazoline, TPN, trastuzumab, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, vitamin B complex/C, voriconazole, zoledronic acid

**Y-site incompatibilities:** Foscarnet

## ADVERSE EFFECTS

**CNS:** *Dizziness, drowsiness,* poor coordination, fatigue, anxiety, euphoria, confusion, paresthesia, neuritis, seizures
**CV:** Hypotension, palpitations
**EENT:** Blurred vision, dilated pupils, tinnitus, nasal stuffiness, dry nose, throat, mouth
**GI:** Nausea, anorexia, diarrhea
**GU:** *Retention,* dysuria, frequency
**HEMA:** Thrombocytopenia, agranulocytosis, hemolytic anemia
**INTEG:** Photosensitivity
**MISC:** Anaphylaxis
**RESP:** Increased thick secretions, wheezing, chest tightness

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO, IM); completely absorbed (**IV**) |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Liver (95%) |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 2½-7 hr |

### Pharmacodynamics

| | PO | IM | IV |
|---|---|---|---|
| **Onset** | 15-60 min | 30 min | Immediate |
| **Peak** | 2-4 hr | 2-4 hr | Unknown |
| **Duration** | 4-8 hr | 4-8 hr | 4-8 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression

### Drug classifications

Antidepressants (tricyclic), barbiturates, CNS depressants, opiates, sedative/hypnotics: increased CNS depression
MAOIs: increased effect of diphenhydrAMINE

### Drug/lab test

False negative: skin allergy tests (discontinue antihistamines 3 days before testing)

## NURSING CONSIDERATIONS

### Assessment

- Assess respiratory status: rate, rhythm, increase in bronchial secretions, wheezing, chest tightness; provide fluids to 2 L/day to decrease secretion thickness
- Monitor I&O ratio: be alert for urinary retention, frequency, dysuria, especially geriatric; product should be discontinued if these occur
- Monitor CBC during long-term therapy; blood dyscrasias may occur but are rare
- If giving for dystonic reactions, assess type of involuntary movements and evaluate response to this medication
- Assess cough characteristics including type, frequency, thickness of secretions; evaluate response to this medication if using for cough
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if clearly needed, do not breastfeed, excreted in breast milk
- Teach patient product should be discontinued 4 days prior to skin allergy tests

### Patient/family education

- Tell patient that a false-negative result may occur with skin testing; these procedures should not be scheduled until 3 days after discontinuing use

- Caution patient to avoid hazardous activities and activities requiring alertness, since dizziness may occur; instruct patient to request assistance with ambulation
- Teach patient to use sunscreen to prevent photosensitivity
- Advise patient to avoid alcohol, other depressants; may potentiate effect; CNS depression may occur
- Teach all aspects of product uses; to notify prescriber if confusion, sedation, hypotension occur; to avoid driving and other hazardous activity if drowsiness occurs; to avoid alcohol or other CNS depressants that may potentiate effect
- Advise patient to avoid breastfeeding; not to breastfeed (injectable)
- Teach patient not to use in child <6 yr, deaths have occurred, do not use in any child for sleep

### Evaluation

**Positive therapeutic outcome**
- Absence of motion sickness
- Absence of nausea, vomiting
- Ability to sleep
- Absence of cough
- Decrease in involuntary movements

## TREATMENT OF OVERDOSE:
- Administer lavage, diazePAM, vasopressors, phenytoin **IV**

## divalproex sodium
*See valproate*

**⚠ HIGH ALERT**

## DOBUTamine (Rx)
(doe-byoo'ta-meen)
*Func. class.:* Adrenergic direct-acting $\beta_1$-agonist, inotropic agent, cardiac stimulant
*Chem. class.:* Catecholamine

**Do not confuse:** DOBUTamine/DOPamine

**ACTION:** Causes increased contractility, increased cardiac output without marked increase in heart rate by acting on $\beta_1$-receptors in heart; minor $\alpha/\beta_2$ effects

**Therapeutic outcome:** Cardiac output increased with decreased fatigue and dyspnea

**USES:** Cardiac decompensation due to organic heart disease or cardiac surgery

**Unlabeled uses:** Cardiogenic shock in children, congenital heart disease in children undergoing cardiac catheterization

## CONTRAINDICATIONS
Hypersensitivity, idiopathic hypertrophic subaortic stenosis

**Precautions:** Pregnancy, breastfeeding, children, hypertension, CAD, MI, hypovolemia, dysrhythmias, sulfite hypersensitivity, renal failure, geriatrics

## DOSAGE AND ROUTES
**Adult and child: IV** INF 0.5-1 mcg/kg/min; titrate to 2-20 mcg/kg/min; may increase to 40 mcg/kg/min if needed

**Available forms:** Inj 12.5 mg/ml, 250 mg/20 ml

### Implementation
**Injectable administration**
- Visually inspect parenteral products for particulate matter and discoloration prior to administration whenever solution and container permit

**IV administration**
NOTE: Infusions lasting up to 72 hr have been given without development of tolerance. However, β-receptor desensitization may occur with prolonged infusions of any β-adrenergic agonist, including DOBUTamine, or as a consequence of sympathetic compensatory mechanisms associated with advanced congestive heart failure, resulting in alterations in DOBUTamine pharmacodynamics. Experience with intravenous DOBUTamine in controlled trials does not extend beyond 48 hours of repeated boluses and/or continuous infusions
- Must be diluted before administration
- Infuse into a large vein

**Dilution**
- Concentrate for injection must be diluted with at least 50 ml of a compatible IV solution (strongly alkaline [i.e., sodium bicarbonate] solutions are incompatible). A common dilution is 500 mg (40 ml) in 210 ml $D_5W$ or NS (withdraw 40 ml from a 250 ml bag) to produce a final concentration of 2000 mcg/ml; or 1000 mg (80 ml) in 170 ml $D_5W$ or NS (withdraw 80 ml from a 250 ml bag) to produce a final concentration of 4000 mcg/ml. Max 5000 mcg/ml and should be adjusted according to the fluid requirements of the patient

**Infusion**
- Premixed bags of in $D_5W$ solutions may be a pink color that, if present, will increase with time; this color change is due to slight oxidation of the drug, but there is no significant loss of potency.

- Do not give DOBUTamine simultaneously with solutions containing sodium bicarbonate or strong alkaline solutions (incompatible)
- Infusion of should be started at a low rate and titrated frequently to reach the optimal dosage; dosage titration is guided by the patient's response, including systemic blood pressure, urine flow, frequency of ectopic activity, heart rate, and measurements of cardiac output, central venous pressure, and/or pulmonary capillary wedge pressure

**Y-site compatibilities:** Alfentanil, alprostadil, amifostine, amikacin, aminocaproic acid, amiodarone, anidulafungin, argatroban, ascorbic acid injection, atenolol, atracurium, atropine, aztreonam, benztropine, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, cladribine, clarithromycin, cloNIDine, codeine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexmedetomidine, digoxin, dilTIAZem, diphenhydrAMINE, DOCEtaxel, DOPamine, doripenem, doxacurium, DOXOrubicin, DOXOrubicin liposomal, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, epoetin alfa, eptifibatide, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, irinotecan, isoproterenol, labetalol, levofloxacin, lidocaine, linezolid, LORazepam, LR, magnesium sulfate, mannitol, mechlorethamine, meperidine, meropenem, metaraminol, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, miconazole, milrinone, minocycline, mitoXANtrone, morphine, multiple vitamins injection, mycophenolate mofetil, nafcillin, nalbuphine, naloxone, netilmicin, niCARdipine, nitroglycerin, norepinephrine, octreotide, ondansetron, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, papaverine, pentamidine, pentazocine, phenylephrine, polymyxin B, potassium chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, pyridoxine, quiNIDine, raNITIdine, remifentanil, Ringer's, ritodrine, riTUXimab, rocuronium, sodium acetate, succinylcholine, SUFentanil, tacrolimus, temocillin, teniposide, theophylline, thiamine, thiotepa, tigecycline, tirofiban, TNA, tobramycin, tolazoline, TPN, trastuzumab, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRISTine, vinorelbine, voriconazole, zidovudine, zoledronic acid

**Y-site incompatibilities:** Acyclovir, alteplase, aminophylline, foscarnet, phytonadione

## ADVERSE EFFECTS

**CNS:** *Anxiety,* headache, dizziness, fatigue
**CV:** Palpitations, tachycardia, hypo/hypertension, PVCs, angina
**ENDO:** Hypokalemia
**GI:** Heartburn, nausea, vomiting
**MS:** Muscle cramps (leg)
**RESP:** Dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | 2 min |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 1-5 min |
| **Peak** | 10 min |
| **Duration** | <10 min |

## INTERACTIONS

### Individual drugs

Atomoxetine: increased pressor effect, dysrhythmias
Bretylium, oxytocin: increased dysrhythmias
Guanethidine: increased severe hypertension
Oxytocin: increased pressor effects

### Drug classifications

Anesthetics (general): increased dysrhythmias
Antidepressants (tricyclic), COMT inhibitors, MAOIs, oxytocics: increased pressor response, dysrhythmias
β-Blockers: decreased action of DOBUTamine

## NURSING CONSIDERATIONS

### Assessment

- **Assess for hypovolemia;** if present, correct before beginning treatment with DOBUTamine; avoid use in patients with atrial fibrillation before digitalization
- **Monitor ECG for dysrhythmias, ischemia** during treatment; some patients may not need continuous ECG monitoring; also monitor PCWP, CVP, $CO_2$, urinary output; notify prescriber if <30 ml/hr, may induce ectopic beats

- **Assess for heart failure:** bibasilar crackles, $S_3$ gallop, dyspnea, neck vein distention in patients with cardiomyopathy or HF
- **Assess for oxygenation or perfusion deficit:** decreased B/P, chest pain, dizziness, loss of consciousness
- Monitor serum electrolytes, urine output, correct electrolytes before use
- Monitor B/P and pulse q5min during infusion; if B/P drops 30 mm Hg, stop infusion and call prescriber
- Monitor ALT, AST, bilirubin daily
- Monitor for sulfite sensitivity, which may be life threatening
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, cautious use in breastfeeding, excretion unknown

### Patient/family education

- Teach patient reason for medication and expected results, reason for all monitoring and procedures
- Advise patient to report dyspnea, headache, **IV** site discomfort, chest pain, numbness of extremities

### Evaluation

**Positive therapeutic outcome**

- Increased cardiac output
- Decreased PCWP, adequate CVP
- Decreased dyspnea, fatigue, edema, ECG
- Increased urine output

## TREATMENT OF OVERDOSE:

Discontinue product, support circulation

**⚠ HIGH ALERT**

# DOCEtaxel (Rx)

(doe-se-tax'el)

**Docefrez, Taxotere**

*Func. class.:* Antineoplastic, miscellaneous

**Do not confuse:** Taxotere/Taxol

**ACTION:** Inhibits the reorganization of the microtubule network needed for interphase and mitotic cellular functions; also causes abnormal bundles of microtubules during cell cycle and multiple esters of microtubules during mitosis

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** Locally advanced or metastatic breast cancer, non–small cell lung cancer, androgen-independent metastatic prostate cancer, postsurgery operable node-positive breast cancer, induction treatment of locally advanced squamous cell cancer of the head/neck, adjuvant treatment of breast cancer with CARBOplatin and trastuzumab, gastric adenocarcinoma

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity to this product, bilirubin exceeding upper normal limit

**BLACK BOX WARNING:** Hypersensitivity to other products with polysorbate 80, neutropenia (neutrophils $<1500/mm^3$)

**Precautions:** Children, CV disease, pulmonary disorders, bone marrow depression, herpes zoster, pleural effusion

**BLACK BOX WARNING:** Edema, hepatic disease, lung cancer, taxane hypersensitivity

## DOSAGE AND ROUTES

- Other regimens are used

**Locally advanced or metastatic breast cancer after failure of other chemotherapy**

**Adult: IV** 60-100 $mg/m^2$ given over 1 hr q3wk; if neutrophil count is $<500/mm^3$ for >1 wk, reduce dose by 25%

**Operable node-positive breast cancer; adjuvant postsurgery treatment of operable node-positive breast cancer**

**Adult: IV** (TAC regimen) 75 $mg/m^2$ 1 hr after DOXOrubicin 50 $mg/m^2$ and cyclophosphamide 500 $mg/m^2$ q3wk for 6 cycles

**Adjuvant treatment of operable stage I-III invasive breast cancer in combination with cyclophosphamide**

**Adult: IV** (TAC) regimen DOCEtaxel 75 $mg/m^2$ with cyclophosphamide 600 $mg/m^2$ q21day × 4 cycles

**Locally advanced or metastatic non–small cell lung cancer after failure of CISplatin chemotherapy**

**Adult: IV** 75 $mg/m^2$ over 1 hr q3wk; if neutrophil count is $<500/mm^3$ for >1 wk, reduce dose to 55 $mg/m^2$; if patient develops grade 3 peripheral neuropathy, stop product

**Unresectable, locally advanced or metastatic non–small cell lung cancer previously treated with chemotherapy**

**Adult: IV** 75 $mg/m^2$ over 1 hr, then CISplatin 75 $mg/m^2$ **IV** given over 30-60 min q3wk; reduce

dose to 65 mg/m$^2$ in those with hematologic or nonhematologic toxicities

### Androgen-independent metastatic prostate cancer

**Adult: IV** 75 mg/m$^2$ given over 1 hr q3wk, with 5 mg predniSONE PO bid continuously; give dexamethasone 8 mg PO at 12 hr, 3 hr, and 1 hr prior to DOCEtaxel; if neutrophil count is <500 cells/mm$^3$ for more than 1 wk or other toxicities occur, reduce dose to 60 mg/m$^2$

### Squamous cell cancer of head/neck

**Adult: IV** 75 mg/m$^2$ over 1 hr, then CISplatin 100 mg/m$^2$ over 1 hr on day 1, then 5-FU 1000 mg/m$^2$/day CONT INF × 5 days, repeat cycle q3wk

### Gastric adenocarcinoma

**Adult: IV** 75 mg/m$^2$ q3wk, given with CISplatin, fluorouracil

**Available forms:** Inj 10 mg/ml, 20 mg/0.5 ml, 20 mg/ml, 80 mg/2 ml, 80 mg/4 ml; 20, 80 mg powder for injection

### Implementation

- Give top or systemic analgesics for pain to lessen effects of stomatitis
- Give liquid diet: carbonated beverages; gelatin may be added if patient is not nauseated or vomiting
- Confirm that dexamethasone was given 12 hr and 6 hr before inf begins
- Store prepared sol up to 27 hr in refrigerator

**Intermittent IV infusion route**

- Use gloves and cytotoxic handling precautions
- Use non-PVC bag and use non-DEHP tubing
- Double-check all orders and products, errors can be fatal
- Allow vials to warm to room temperature, withdraw all diluent and inject in vial of DOCEtaxel, rotate gently to mix, allow to stand to decrease foaming, then withdraw the required amount (10 mg/ml) and inject in 250 ml of 0.9% NaCl or $D_5W$, mix gently, give over 1 hr

**Y-site compatibilities:** Acyclovir, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amiodarone, amphotericin B lipid complex, ampicillin, ampicillin-sulbactam, anidulafungin, atenolol, atracurium, azithromycin, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, busulfan, butorphanol, calcium chloride/gluconate, CARBOplatin, carmustine, caspofungin, ceFAZolin, cefepime, cefonicid, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, codeine, cyclophosphamide, cycloSPORINE, cytarabine, dacarbazine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, dexrazoxane, diazePAM, digoxin, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOPamine, doripenem, doxacurium, DOXOrubicin HCl, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, ertapenem, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, foscarnet, fosphenytoin, furosemide, ganciclovir, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, haloperidol, heparin, hydrALAZINE, hydrocortisone, HYDROmorphone, hydrOXYzine, ifosfamide, imipenem-cilastatin, inamrinone, insulin (regular), irinotecan, isoproterenol, ketorolac, labetalol, leucovorin, levofloxacin, levorphanol, lidocaine, linezolid, LORazepam, LR, magnesium sulfate, mannitol, meperidine, meropenem, mesna, methotrexate, methyldopate, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, minocycline, mitoXANTRONE, mivacurium, morphine, nafcillin, naloxone, nesiritide, netilmicin, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ofloxacin, ondansetron, oxaliplatin, palonosetron, pamidronate, pancuronium, pantoprazole, PEMEtrexed, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phenylephrine, piperacillin, piperacillin-tazobactam, polymyxin B, potassium chloride/phosphates, procainamide, prochlorperazine, promethazine, propranolol, quiNIDine, quinupristin-dalfopristin, raNITIdine, remifentanil, riTUXimab, rocuronium, sodium acetate/bicarbonate/phosphates, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, tacrolimus, teniposide, theophylline, thiopental, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, trastuzumab, trimethobenzamide, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CNS:** Seizures
**CV:** *Hypotension, fluid retention, peripheral edema,* flushing, MI, sinus tachycardia
**GI:** *Nausea, vomiting, diarrhea,* hepatotoxicity, stomatitis, colitis
**HEMA:** Neutropenia, leukopenia, thrombocytopenia, anemia, bleeding, infections, myelosuppression
**INTEG:** *Alopecia,* nail pain, rash, skin eruptions
**MISC:** Amenorrhea, fever of unknown origin, secondary malignancy, Stevens-Johnson syndrome, epiphora

**MS:** *Arthralgia, myalgia*, back pain, weakness
**NEURO:** *Peripheral neuropathy*
**RESP:** Dyspnea, pulmonary edema, fibrosis, embolism
**SYST:** Hypersensitivity reactions, AML, death

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Completely absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Liver, extensively |
| **Excretion** | Fecal |
| **Half-life** | 11.1 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Anastrozole (high doses), aprepitant, clarithromycin, conivaptan, delavirdine, efavirenz (induces or inhibits), erythromycin, fluconazole, FLUoxetine, fluvoxaMINE, fosaprepitant, imatinib, itraconazole, ketoconazole, nefazodone, voriconazole, and others: increased CYP3A inhibition

Bosentan, carBAMazepine, nevirapine, phenytoin, fosphenytoin, rifabutin, rifAMPin, rifapentine: increased CYP3A induction

CycloSPORINE, erythromycin, ketoconazole, troleandomycin: altered metabolism of DOCEtaxel

### Drug classifications

Antineoplastics, radiation: increased myelosuppression

Barbiturates: increased CYP3A induction

Live virus vaccines: decreased immune response

## NURSING CONSIDERATIONS

### Assessment

- **Assess CNS changes:** confusion, paresthesias, peripheral neuropathy, dysesthesia, pain, weakness: if severe, product should be discontinued
- Check buccal cavity q8hr for dryness, sores or ulceration, white patches, oral pain, bleeding, dysphagia; obtain prescription for viscous lidocaine (Xylocaine) to use in mouth

**BLACK BOX WARNING: Taxane: assess symptoms indicating severe allergic reaction, anaphylaxis:** rash, pruritus, urticaria, purpuric skin lesions, itching, flushing

**BLACK BOX WARNING: Neutropenia:** Monitor CBC, differential, platelet count weekly; withhold product if WBC is $<1500/mm^3$ or platelet count is $<100{,}000/mm^3$, notify prescriber of results

**BLACK BOX WARNING:** Use of DOCEtaxel, polysorbate 80 are contraindicated, some products may contain polysorbate 80

**BLACK BOX WARNING: Edema:** oral corticosteroids should be given as premedication; assess for fluid retention, may be severe, is usually dose related

**BLACK BOX WARNING: Lung cancer:** increased mortality in those with increased LFTs and a history of platinum-based products

- **Monitor renal function tests:** BUN, creatinine, serum uric acid, urine CCr before, during therapy; check I&O ratio; report fall in urine output to $<30$ ml/hr
- Monitor temp (may indicate beginning of infection)

**BLACK BOX WARNING: Hepatic disease:** Monitor liver function tests before, during therapy (bilirubin, AST, ALT, LDH) as needed or monthly; check for jaundice of skin and sclera, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea

**BLACK BOX WARNING: Assess for bone marrow depression/bleeding:** hematuria, stool guaiac, bruising or petechiae, mucosa or orifices q8hr; check for inflammation of mucosa, breaks in skin

**BLACK BOX WARNING: Hypersensitive reactions, anaphylaxis,** usually during first or second dose, mild reactions can be treated by slowing infusion, treating symptomatically, do not retreat in those with severe reactions

- Assess effects of alopecia on body image; discuss feelings about body changes

### Patient/family education

- **Pregnancy/breastfeeding:** Inform patient that nonhormonal contraceptive measures are recommended during therapy and >4 mo after; teratogenic effects are possible

• Teach patient to avoid use of products containing aspirin or ibuprofen, razors, commercial mouthwash, since bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools)
• Instruct patient to report signs of **anemia** (fatigue, headache, irritability, faintness, shortness of breath) and CNS reactions (confusion, psychosis, nightmares, seizures, severe headaches)
• Instruct patient to report signs of **infection:** fever, sore throat, flulike symptoms
• Inform patient that hair may be lost during treatment; a wig or hairpiece may make patient feel better; new hair may be different in color and texture
• Inform patient that receiving vaccinations during therapy may cause serious reactions
• Instruct patient to rinse mouth tid-qid with water, club soda; brush teeth bid-qid with soft brush or cotton-tipped applicators for stomatitis; use unwaxed dental floss

### Evaluation

**Positive therapeutic outcome**
• Prevention of rapid division of malignant cells

## docosanol topical
*See Appendix B*

## docusate calcium (OTC)
(dok'yoo-sate cal'see-um)
**Kao-Tin, Kaopectate Stool Softener**
## docusate sodium (OTC)
**Colace, Correctol, Diocto, Docu DOK, Doculace, Enemeez, Fleet Pedialax, Fleet Sof-Lax, Phillips Liquid-Gels, Selex, Silace, Soflax**
*Func. class.:* Laxative, emollient
*Chem. class.:* Anionic surfactant

**ACTION:** Increases water, fat penetration in intestine; allows for easier passage of stool

**Therapeutic outcome:** Passage of softened stool, absence of constipation

**USES:** Prevent hard, dry stools, prevent constipation, soften fecal impaction (rectal route)

## CONTRAINDICATIONS
Hypersensitivity, obstruction, fecal impaction, nausea/vomiting

**Precautions:** Pregnancy, breastfeeding

## DOSAGE AND ROUTES
**Adult:** PO 50-300 mg/day (docusate sodium) or 240 mg (docusate calcium); enema 4 ml (docusate sodium)
**Child >12 yr:** Enema 2 ml (docusate sodium)
**Child 6-12 yr:** PO 40-150 mg/day (docusate sodium) in divided doses
**Child 3-6 yr:** PO 20-60 mg/day (docusate sodium) in divided doses
**Child <3 yr:** PO 10-40 mg/day (docusate sodium) in divided doses

**Available forms: Docusate calcium:** caps 240 mg; **docusate sodium:** caps 50, 100, 250 mg; tabs 100 mg; liquid syr 20 mg/5 ml, 50 mg/5 ml, enema 283 mg

### Implementation
**PO route**
• Dilute oral sol in juice or other fluid to disguise taste
• Give tabs or caps with 8 oz of liquid; give on empty stomach for increased absorption, results
• Store in cool environment; do not freeze

## ADVERSE EFFECTS
**EENT:** Bitter taste, throat irritation
**GI:** Nausea, anorexia, cramps, diarrhea
**INTEG:** Rash

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Minimal (PO) |
| **Distribution** | Unknown |
| **Metabolism** | Not metabolized |
| **Excretion** | Bile |
| **Half-life** | Unknown |

### Pharmacodynamics

| | PO | RECT |
|---|---|---|
| **Onset** | 24-72 hr | 4-6 hr |
| **Peak** | Unknown | Unknown |
| **Duration** | Unknown | Unknown |

## INTERACTIONS
### Individual drugs
Mineral oil: toxicity

### Drug/herb
Flax, senna: increased laxative action

## NURSING CONSIDERATIONS
### Assessment
• Assess cramping, rectal bleeding, nausea, vomiting; if these symptoms occur, product should be discontinued; identify cause of constipation; identify fluids, bulk, or exercise is missing from lifestyle
• **Pregnancy/breastfeeding:** low risk of pregnancy, breastfeeding

### Patient/family education

- Discuss with patient that adequate fluid consumption is as necessary as bulk, exercise for adequate bowel function
- Teach patient that normal bowel movements do not always occur daily
- Advise patient not to use in presence of abdominal pain, nausea, vomiting; tell patient to notify prescriber if unrelieved constipation or if symptoms of electrolyte imbalance occur: muscle cramps, pain, weakness, dizziness, excessive thirst
- Advise patient that product may take up to 3 days to soften stools
- Instruct patient to take oral preparation with a full glass of water and increase fluid intake unless on fluid restrictions
- Caution patients with heart disease to avoid using the Valsalva maneuver to expedite evacuation

### Evaluation

**Positive therapeutic outcome**

- Decreased constipation within 3 days

**⚠ HIGH ALERT REMS**

## dofetilide

(doff-ee-till′-lide)

**Tikosyn**

*Func. class.:* Antidysrhythmic (Class III)

**ACTION:** Blocks cardiac ion channel carrying the rapid component of delayed potassium current, no effect on sodium channels

**Therapeutic outcome:** Absence of atrial fibrillation

**USES:** Atrial fibrillation, flutter, maintenance of normal sinus rhythm

## CONTRAINDICATIONS

Hypersensitivity, digoxin toxicity, aortic stenosis, pulmonary hypertension, children, severe renal disease, QT prolongation, torsades de pointes, renal failure

**Precautions:** Pregnancy, breastfeeding, AV block, bradycardia, electrolyte imbalance, renal disease

**BLACK BOX WARNING:** arrhythmias, ventricular **arrhythmias**/tachycardia, requires an experienced clinician, in a specialized care setting

## DOSAGE AND ROUTES

### Conversion of atrial fibrillation/atrial flutter to normal sinus rhythm; or, maintenance therapy with highly symptomatic atrial fibrillation/atrial flutter of ≥1 wk duration

**Adult:** PO Individualize dosage based on renal function and QTc in a monitored facility. Refer to the step-by-step procedure for determining the initial dose of dofetilide

### Maintenance therapy of atrial fibrillation/atrial flutter after hospital discharge

**Adult:** PO continue dosage at discharge as from initial dosage titration. Individualize dosage based on renal function and QTc, which should be re-evaluated q3mo or as medically warranted; if the QTc >500 milliseconds (550 msec in patients with ventricular conduction abnormalities) at any time, discontinue; carefully monitor until QTc returns to baseline; if renal function deteriorates, adjust the dose as described in the dosage guidelines for patients with renal impairment

### Discontinuation of dofetilide before use of interacting drugs

**Adult:** PO discontinue dofetilide for ≥2 days before starting a potentially interacting drug

### Renal dose

**Adult:** PO initial dose for CCr >60 mg/ml 500 mcg bid; CCr 40-60 mg/min 250 mcg bid; CCr 20-39 mg/min 125 mcg bid; CCr <20 mg/min do not use

**Available forms:** Caps 125, 250, 500 mcg

### Implementation

- Physician and pharmacy must be registered to use product
- With patient hospitalized for ≥ 3 days

**BLACK BOX WARNING: Step 1: Assess cardiac conduction:** Before first dose, the QTc interval must be determined using an average of 5-10 beats; if the QTc interval is >440 msec (or >500 msec in ventricular conduction abnormalities), do not use. If baseline heart rate is <60 bpm, then the QT interval should be used
**Step 2: Assess renal function:** Before first dose, determine renal function using the Cockroft-Gault equation, use actual body weight to calculate creatinine clearance
**Step 3: Adjust starting dose according to renal function:** Refer to the Renal dose section (above) to determine the appropriate initial dose
**Step 4: ECG monitoring:** Begin continuous ECG monitoring starting with the first dose
**Step 5: Dose adjustments:** Approximately 2-3 hr after the first dose, determine the QTc interval. If the QTc interval has increased by >15% (compared with baseline), or, if the QTc interval is >500 msec (>550 msec in patients with ventricular conduction abnormalities), the initial dosage should be reduced by half as follows:
- Decrease an initial dose of 500 mcg bid to 250 mcg bid
- Decrease an initial dose of 250 mcg bid to 125 mcg bid
- Decrease an initial dose of 125 mcg bid to 125 mcg daily

**Step 6: Reassess QTc interval:** Reassess the QTc interval 2-3 hr after each subsequent dose; if, the QTc interval lengthens to >500 msec (or >550 msec in patients with ventricular conduction abnormalities), **discontinue**
**Step 7: ECG Monitoring:** Monitor continuous ECG for a minimum of 3 days or for 12 hr after conversion to normal sinus rhythm, whichever is greater

## ADVERSE EFFECTS

**CNS:** *Syncope, dizziness,* headache, stroke
**CV:** *Hypotension, postural hypotension, bradycardia,* angina, PVCs, substernal pressure, precipitation of angina, transient hypertension, QT prolongation, torsades de pointes, ventricular dysrhythmias, chest pain
**GI:** *Nausea, vomiting,* severe diarrhea, anorexia
**MISC:** Angioedema
**RESP:** Dyspnea, respiratory infections

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | >90% |
| **Distribution** | Steady state 2-3 days |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys 80% |
| **Half-life** | 10 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

AMILoride, entecavir, lamiVUDine, memantine, metFORMIN, procainamide, triamterene, trospium: increased toxicity
Arsenic trioxide, chloroquine, ciprofloxacin, clarithromycin, droperidol, erythromycin, halofantrine, haloperidol, levomethadyl, methadone, pentamidine, ziprasidone: increased QT prolongation, torsades de pointes
Cimetidine, hydroCHLOROthiazide, ketoconazole, megestrol, metFORMIN, prochlorperazine, triamterene, trimethoprim/sulfamethoxazole, verapamil: do not use together

### Drug classifications

Antiretroviral protease inhibitors: increased dofetilide levels
Class IA/III antidysrhythmics, some phenothiazines: increased QT prolongation, torsades de pointes
Diuretics, potassium depletion: increased hypokalemia
CYP3A4 inhibitors, SSRIs, macrolides, azoles, protease inhibitors, amiodarone, doltizem, quinine: Increase: dysrhythmias

### Drug/food

- Do not use with grapefruit juice

## NURSING CONSIDERATIONS

### Assessment

- **Severe renal impairment:** CCr <20 ml/min: do not use for mild to moderate renal disease, monitor BUN/creatinine; adjust dose based on creatinine clearance
- AF patients should receive anticoagulation prior to cardioversion
- Nausea, vomiting, before and after use
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, avoid breastfeeding, excretion unknown

### Patient/family education
- Instruct patient to notify prescriber if fast heartbeats with fainting or dizziness occur
- Instruct patient to notify all prescribers of all medications and supplements taken
- Teach patient that if a dose is missed, do not double, take next dose at usual time

### Evaluation

**Positive therapeutic outcome**
- Increased control in atrial fibrillation

## dolasetron (Rx)
(do-la′se-tron)
**Anzemet**
*Func. class.:* Antiemetic
*Chem. class.:* 5-HT receptor antagonist

**ACTION:** Prevents nausea, vomiting by blocking serotonin peripherally, centrally, and in the small intestine

**Therapeutic outcome:** Control of nausea, vomiting

**USES:** Prevention of postoperative nausea, vomiting

**Unlabeled uses:** Radiotherapy-induced nausea/vomiting

## CONTRAINDICATIONS
Hypersensitivity

**Precautions:** Pregnancy, breast-feeding, children, geriatric, hypokalemia, electrolyte imbalances, granisetron, ondansetron, palonosetron hypersensitivity, QT prolongation

## DOSAGE AND ROUTES
### Prevention of postoperative nausea/vomiting
**Adult: IV** 12.5 mg as a single dose 15 min before cessation of anesthesia; PO 100 mg 2 hr before surgery (prevention only)
**Child 2-16 yr: IV** 0.35 mg/kg as a single dose 15 min before cessation of anesthesia; PO 1.2 mg/kg within 2 hr before surgery (prevention only)

### Prevention of cancer chemotherapy nausea/vomiting (PO only)
**Adult:** PO 100 mg 1 hr before chemotherapy
**Child 2-16 yr:** PO 1-8 mg/kg, 1 hr before chemotherapy

**Available forms:** Tabs 50, 100 mg; inj 20 mg/ml, 12.5 mg/0.625 ml

### Implementation
**PO route**
- Do not mix product for oral administration in juice until immediately before administration; apple or apple-grape diluted can be kept for 2 hr at room temperature
- Store at room temp 48 hr after dilution

**Intermittent IV infusion route**
- Administer by inj 100 mg/30 sec or less or diluted in 50 ml of compatible sol; give over 15 sec
- Store at room temperature for 24 hr after dilution
- Do not admix

## ADVERSE EFFECTS
**CNS:** *Headache,* dizziness, fatigue, drowsiness, serotonin syndrome
**CV:** Dysrhythmias, ECG changes, hypo/hypertension, tachycardia, bradycardia, QT prolongation, torsades de pointes, ventricular tachycardia/fibrillation, cardiac arrest (IV)
**GI:** *Diarrhea,* constipation, increased AST, ALT, abdominal pain, anorexia
**GU:** Urinary retention, oliguria
**MISC:** Rash, bronchospasm

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Completely absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys |
| **Half-life** | Unknown |

### Pharmacodynamics
Unknown

## INTERACTIONS
### Individual drugs
Arsenic trioxide, chloroquine, clarithromycin, droperidol, erythromycin, halofantrine, haloperidol, levomethadyl, methadone, pentamidine, ziprasidone: increased QT prolongation; occurs at higher dose of dolasetron
Cimetidine: increased dolasetron levels
RifAMPin: decreased dolasetron levels

### Drug classifications
Antidysrhythmics: increased dysrhythmias
Class IA/III antidysrhythmics, some phenothiazines, loop diuretics, thiazide: increased QT prolongation

## NURSING CONSIDERATIONS
### Assessment
- **QT prolongation and QRS, PR prolongation:** do not use in those with congenital long QT syndrome, hypokalemia, hypomagnesemia, complete heart block (unless a pacemaker is in place); correct electrolytes before use; monitor ECG in the elderly, renal cardiac disease

- **Assess for hypersensitivity reaction:** rash, bronchospasm
- Assess for cardiac conduction conditions; electrolyte imbalances or dysrhythmias
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if clearly needed, cautious use in breastfeeding, excretion unknown
- **Serotonin syndrome:** Usually when combined with SSRIs, SNRIs, MAOIs

### Patient/family education

- Instruct patient to report diarrhea, constipation, rash, or changes in respirations; may cause headache; use analgesic
- Teach patient reason for medication and expected results

### Evaluation

**Positive therapeutic outcome**

- Absence of nausea, vomiting during cancer chemotherapy

## dolutegravir

(dole-oo-teg'ra-vir)

**Tivicay**

*Func. class.:* Antiretroviral

*Chem. class.:* HIV integrase strand transfer inhibitor (ISTIs)

## ACTION:

Inhibits catalytic activity of HIV integrase, which is an HIV-encoded enzyme needed for replication

**Therapeutic outcome:** Improvement in cell counts, T-cell counts

## USES:

HIV in combination with other antiretrovirals

## CONTRAINDICATIONS

Breastfeeding, hypersensitivity

**Precautions:** Pregnancy, children, geriatric patients, hepatic disease, immune reconstitution syndrome, hepatitis, antimicrobial resistance, lactase deficiency

## DOSAGE AND ROUTES

**Adult and child >12 yr and ≥40 kg (treatment-naïve or treatment-experienced but integrase strand transfer inhibitor–naïve): PO** 50 mg/day; if given with efavirenz, fosamprenavir/ritonavir, tipranavir/ritonavir or RifAMPin give 50 mg bid

**Available forms:** Tabs 50 mg

### Implementation

- May give without regard to meals, with 8 oz of water
- Store at room temperature
- Give 2 hr before or 6 hr after cation-containing antacids or laxatives, sucralfate, oral iron, oral calcium, or buffered products

## ADVERSE EFFECTS

**CNS:** Fatigue, fever, dizziness, headache, asthenia, suicidal ideation
**CV:** MI
**GI:** Nausea, vomiting, diarrhea, abdominal pain, asthenia, gastritis, hepatitis
**INTEG:** Rash, pruritus, urticaria
**META:** Hyperglycemia
**SYST:** Immune reconstitution syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Steady state 5 days, 98% protein binding |
| **Metabolism** | Liver; some patients are poor metabolizers |
| **Excretion** | Feces 53%, urine 31% |
| **Half-life** | Terminal 14 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Peak 2-3 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Efavirenz, RifAMPin tenofovir, tipranavir/ritonavir: decreased levels of each product

### Drug classifications

Antacids, buffered products, laxatives/sucralfate, oral iron products, oral calcium products, buffered products: decreased effect of dolutegravir

### Drug/herb

St. John's wort: avoid concurrent use

## NURSING CONSIDERATIONS

### Assessment

- **HIV infection:** monitor CD4, T-cell count, plasma HIV RNA, viral load; resistance testing before treatment, at treatment failure
- Perform drug resistance testing prior to use in treatment-naïve patients
- Immune reconstitution syndrome, usually during initial phase of treatment, may be antiinfective before starting
- Monitor total/HDL/LDL cholesterol baseline and periodically, all may be elected
- **Pregnancy/breastfeeding:** All HIV-positive women should receive antiretroviral therapy, report pregnancy to the Antiretroviral

Pregnancy Registry (800-258-4263), glucose screening should be performed at 24-28 wk gestation, confirm gestation age in each trimester by ultrasound, avoid breastfeeding

### Patient/family education

- Teach patient to take as prescribed; if dose missed to take as soon as remembered up to 1 hr before next dose; not to double dose; not to share with others
- Teach patient that sexual partners need to be told that patient has HIV; that product does not cure infection, just controls symptoms, does not prevent infecting others
- Teach patient to report sore throat, fever, fatigue (may indicate superinfection)
- Teach patient to notify prescriber if pregnancy is planned or suspected; to avoid breastfeeding and to continue follow-up exams and work

### Evaluation

**Positive therapeutic outcome**

- Improvement in cell counts, T-cell counts

## donepezil (Rx)

(don-ep-ee′zill)

**Aricept**

*Func. class.:* Anti-Alzheimer's agent

*Chem. class.:* Reversible cholinesterase inhibitor

**Do not confuse:** Aricept/Aciphex/Azitect

**ACTION:** Elevates acetylcholine concentrations (cerebral cortex) by slowing degradation of acetylcholine released in cholinergic neurons; does not alter underlying dementia

**Therapeutic outcome:** Decreased symptoms of Alzheimer's disease

**USES:** Treatment of mild to severe dementia in Alzheimer's disease

**Unlabeled uses:** Subcortical vascular dementia, dementia with Lewy bodies

## CONTRAINDICATIONS

Hypersensitivity to this product or piperidine derivatives

**Precautions:** Pregnancy, breastfeeding, children, sick sinus syndrome, history of ulcers, GI bleeding, hepatic disease, bladder obstruction, asthma, seizures, COPD, abrupt discontinuation, AV block, GI obstruction, Parkinson's disease, surgery

## DOSAGE AND ROUTES

**Adult:** PO 5 mg/day at bedtime; may increase to 10 mg/day after 4-6 wk, may increase to 23 mg/day after 3 mo of 10 mg/day (moderate to severe)

**Available forms:** Tabs 5, 10, 23 mg; oral sol 1 mg/ml

### Implementation

**PO route**

- Give between meals; may be given with meals for GI symptoms
- Administer dosage adjusted to response no more than q4-6wk, oral dosage forms are interchangeable
- Provide assistance with ambulation during beginning therapy; dizziness, ataxia may occur
- Oral sol: measure with calibrated oral syringe or other calibrated device

## ADVERSE EFFECTS

**CNS:** Dizziness, insomnia, somnolence, headache, fatigue, abnormal dreams, syncope, seizures, drowsiness, agitation, depression, confusion, fever, hallucinations

**CV:** Atrial fibrillation, hypo/hypertension, sinus bradycardia, AV block

**GI:** *Nausea, vomiting,* anorexia, *diarrhea,* abdominal pain, weight loss, GI bleeding

**GU:** Frequency, UTI, incontinence

**INTEG:** Rash, flushing, diaphoresis, bruising

**META:** Hyperlipidemia

**MS:** Cramps, arthritis, arthralgia, back pain

**RESP:** Rhinitis, URI, cough, pharyngitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well |
| **Distribution** | Unknown |
| **Metabolism** | Liver to metabolites |
| **Excretion** | Unknown |
| **Half-life** | 10 hr (single dose) |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

CarBAMazepine, dexamethasone, PHENobarbital, phenytoin, RifAMPin: decreased donepezil effect

Succinylcholine: synergistic effects

### Drug classification

Anticholinergics: decreased activity

Cholinergic agonists, cholinesterase inhibitors: synergistic effects

Increase: QT prolongation: astemizole, cisapride, dofetilide, dronedarone, grepafloxacin, mesoridazine, pimozide, probucol,

sparfloxacin, terfenadine, ziprasidone, do not use concurrently
NSAIDs: increased GI intolerance
CYP2D6, CYP3A4 inducers: decreased donepezil effects
CYP2D6, CYP3A4 inhibitors: increased donepezil effects

### Drug/herb
St. John's wort: decreased donepezil effect

### Drug/lab test
Increase: CK

## NURSING CONSIDERATIONS

### Assessment
- Monitor B/P, heart rate: hypo/hypertension
- Assess mental status: affect, mood, behavioral changes, depression, complete suicide assessment
- Assess GI status: nausea, vomiting, anorexia, diarrhea, active/occult GI bleeding
- Assess GU status: urinary frequency, incontinence
- **Beers:** Avoid use in older adults, increases risk of hyper/hypotension/bradycardia
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if use justifies fetal risk, cautious use in breastfeeding, excretion unknown

### Patient/family education
- Advise patient to report side effects: twitching, nausea, vomiting, sweating, dizziness; indicates overdose
- Advise patient to use product exactly as prescribed, not to use with other products, unless approved by prescriber
- Advise patient to notify prescriber of nausea, vomiting, diarrhea (dose increase or beginning treatment), or rash
- Advise patient not to increase or abruptly decrease dosage, serious consequences may result
- Instruct patient that product is not a cure
- Teach patient to report if pregnancy is planned or suspected, avoid breastfeeding

### Evaluation

#### Positive therapeutic outcome
- Decrease in confusion; improved mood

**⚠ HIGH ALERT**

## DOPamine (Rx)
(doe'pa-meen)
*Func. class.:* Agonist, vasopressor, inotropic agent
*Chem. class.:* Catecholamine

**Do not confuse:** DOPamine/DOBUTamine

**ACTION:** Causes increased cardiac output; acts on $\beta_1$- and $\alpha$-receptors, causing vasoconstriction in blood vessels; when low doses are administered, causes renal and mesenteric vasodilatation; $\beta_1$ stimulation produces inotropic effects with increased cardiac output

**Therapeutic outcome:** Increased B/P, cardiac output

**USES:** Shock; to increase perfusion; hypotension, cardiogenic/septic shock

## CONTRAINDICATIONS
Hypersensitivity, ventricular fibrillation, tachydysrhythmias, pheochromocytoma, hypovolemia

**Precautions:** Pregnancy, breastfeeding, geriatric, arterial embolism, peripheral vascular disease, sulfite hypersensitivity, acute MI

**BLACK BOX WARNING:** Extravasation

## DOSAGE AND ROUTES
**Adult: IV** INF 2-5 mcg/kg/min, titrate upward 5-10 mcg/kg/min, max 50 mcg/kg/min; titrate to patient's response
**Child: IV** 1-5 mcg/kg/min initially; usual dosage range 2-20 mcg/kg/min

### HF
**Adult: IV** 3-10 mcg/kg/min

**Available forms:** Inj 40, 80, 160 mg/ml; conc for **IV** inf 0.8, 1.6, 3.2 mg/ml in 250, 500 ml $D_5W$

### Implementation
- Store reconstituted sol for up to 24 hr if refrigerated
- Do not use discolored sol; protect from light

**Continuous infusion route**
- Dilute 200-400 mg/250-500 ml of $D_5W$, 0.9% NaCl, $D_5$/LR, $D_5$/0.45% NaCl, $D_5$/0.9% NaCl, LR; do not use discolored sol; sol is stable for 24 hr; give 0.5-5 mcg/kg/min; may increase by 1-4 mcg/kg/min q15-30min until desired patient response; use infusion pump

**BLACK BOX WARNING: Extravasation:** if extravasation occurs, stop infusion, may inject area with phentolamine 10 mg/15 ml NS

**Y-site compatibilities:** Alfentanil, alprostadil, amifostine, amikacin, aminocaproic acid, aminophylline, amiodarone, anidulafungin, argatroban, ascorbic acid injection, atenolol, atracurium, atropine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate,

CARBOplatin, caspofungin, cefmetazole, cefonicid, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, cladribine, clarithromycin, clindamycin, cloNIDine, codeine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, digoxin, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, doripenem, doxacurium, DOXOrubicin, DOXOrubicin liposomal, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, epoetin alfa, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, folic acid, foscarnet, gatifloxacin, gemcitabine, gemtuzumab, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, irinotecan, isoproterenol, ketorolac, labetalol, levofloxacin, lidocaine, linezolid, LORazepam, LR, magnesium sulfate, mannitol, mechlorethamine, meperidine, methicillin, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, micafungin, miconazole, midazolam, milrinone, minocycline, mitoXANTRONE, morphine, multiple vitamins injection, mycophenolate, nafcillin, nalbuphine, naloxone, netilmicin, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, pantoprazole, papaverine, PEMEtrexed, penicillin G potassium/sodium, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phenylephrine, phytonadione, piperacillin, piperacillin-tazobactam, polymyxin B, potassium chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, pyridoxine, quiNIDine, raNITIdine, remifentanil, Ringer's, ritodrine, riTUXimab, rocuronium, sargramostim, sodium acetate, succinylcholine, SUFentanil, tacrolimus, temocillin, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA, tobramycin, tolazoline, TPN, trastuzumab, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, vitamin B complex/C, voriconazole, warfarin, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CNS:** *Headache,* anxiety
**CV:** *Palpitations,* tachycardia, *hypertension,* ectopic beats, *angina,* wide QRS complex, peripheral vasoconstriction, hypotension
**GI:** *Nausea, vomiting, diarrhea*
**INTEG:** Necrosis, tissue sloughing with extravasation, gangrene
**RESP:** Dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete |
| **Distribution** | Widely |
| **Metabolism** | Liver |
| **Excretion** | Kidney, plasma |
| **Half-life** | 2 min |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 2-5 min |
| **Peak** | Unknown |
| **Duration** | <10 min |

## INTERACTIONS

### Individual drugs

Phenytoin: bradycardia, hypotension

### Drug classifications

α-Adrenergic blockers, β-adrenergic blockers: decreased action of DOPamine
Anesthetics (general): increased dysrhythmias
Antidepressants (tricyclic): increased pressor response
Ergots: severe hypertension
MAOIs: increased hypertension (severe), do not use within 2 wk; increased pressor effect; hypertensive crisis may result
Oxytocics: increased B/P

### Drug/lab test

Increased: urinary catecholamine, serum glucose

## NURSING CONSIDERATIONS

### Assessment

- Monitor ECG for dysrhythmias, ischemia during treatment; some patients may not need continuous ECG monitoring; also monitor PCWP, CVP, $CO_2$, urinary output; notify prescriber if <30 ml/hr
- **Assess for heart failure:** bibasilar crackles, $S_3$ gallop, dyspnea, neck vein distention in patients with cardiomyopathy or HF
- **Assess for oxygenation or perfusion deficit:** decreased B/P, chest pain, dizziness, loss of consciousness
- Monitor B/P and pulse q5min during inf; if B/P drops 30 mm Hg, stop inf and call prescriber

**BLACK BOX WARNING:** Check for extravasation: if this occurs, administer phentolamine mixed with 0.9% NaCl

- **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh

fetal risk, may cause toxicity, avoid use in breastfeeding, excretion unknown

### Patient/family education

- Teach patient reason for medication, expected results, reason for all monitoring and procedures
- Advise patient to report all side effects
- Teach patient to report immediately chest pain, SOB, numbness/tingling of extremities
- Teach patient to report immediately pain, burning, redness at IV site

### Evaluation

#### Positive therapeutic outcome

- Increased cardiac output

### TREATMENT OF OVERDOSE:

Discontinue product, support circulation; give a short-acting α-blocker

## doripenem (Rx)

(dore-i-pen'em)

**Doribax**

*Func. class.:* Antiinfective, miscellaneous

*Chem. class.:* Carbapenem

**Do not confuse:** Doribax/Zovirax

### ACTION:

Bactericidal, interferes with cell wall replication of susceptible organisms; osmotically unstable cell wall swells, bursts from osmotic pressure

**Therapeutic outcome:** Negative C&S; decreasing symptoms and signs of infection

### USES:

Serious infections caused by *Acinetobacter baumannii, Bacteroides caccae, Bacteroides fragilis, Bacteroides thetaiotaomicron, Bacteroides uniformis, Bacteroides vulgatus, Citrobacter freundii, Escherichia coli, Klebsiella pneumoniae, Peptostreptococcus micros, Proteus mirabilis, Pseudomonas aeruginosa, Serratia marcescens, Staphylococcus aureus, Streptococcus contellatus, Streptococcus intermedius;* complicated UTIs, pyelonephritis, complicated intraabdominal infections

### CONTRAINDICATIONS

Hypersensitivity to carbapenems (meropenem, doripenem, imipenem), penicillin, β-lactam; viral infection

**Precautions:** Pregnancy, breastfeeding, geriatric, renal disease, seizure disorder, pseudomembranous colitis, nebulizer or inhalation use, hypersensitivity to cephalosporins, children/adolescents

### DOSAGE AND ROUTES

**Adult: IV** 500 mg every 8 hr × 5-14 days; if improvement occurs after 3 days, switch to an appropriate oral product

#### Renal dose

**Adult:** IV CCr 30-50 ml/min 250 mg over 1 hr q8hr; CCr >10 to <30 ml/min 250 mg over 1 hr q12hr; CCr ≤10 ml/min no data

**Available forms:** Powder for inj 500 mg

### Implementation

#### IV route

- Visually inspect parenteral products for particulate matter and discoloration before use, diluted range in color from clear, colorless solutions to solutions that are clear and slightly yellow
- **Reconstitution:** No bacteriostatic preservative is present; observe aseptic technique while preparing the infusion
- **500-mg dose using the 500 mg vial:** Reconstitute the vial with 10 ml of sterile water for injection or sodium chloride 0.9% (normal saline). Gently shake (50 mg/ml); THE RECONSTITUTED SUSPENSION IS NOT FOR DIRECT INJECTION; FURTHER DILUTION IS REQUIRED. Using a syringe with a 21-G needle, withdraw the suspension and add it to an infusion bag containing 100 ml of NS or $D_5W$; gently shake until clear: final (4.5 mg/ml)
- **250-mg dose using the 500 mg vial:** Reconstitute the vial with 10 ml of sterile water for injection or sodium chloride 0.9% (normal saline). Gently shake (50 mg/ml); THE RECONSTITUTED SUSPENSION IS NOT FOR DIRECT INJECTION; FURTHER DILUTION IS REQUIRED. Using a syringe with a 21-G needle, withdraw the 5 ml (250 mg) and add it to an infusion bag containing 100 ml of normal saline or $D_5W$; gently shake until clear; remove 55 ml of this solution and discard. The remaining infusion solution contains 250 mg (4.5 mg/ml)
- **250-mg dose using the 250 mg vial:** Reconstitute the vial with 10 ml of sterile water for injection or sodium chloride 0.9% (normal saline). Gently shake (25 mg/ml); THE RECONSTITUTED SUSPENSION IS NOT FOR DIRECT INJECTION; FURTHER DILUTION IS REQUIRED. Using a syringe with a 21-G needle, withdraw the contents of the vial and add it to an infusion bag containing 50 or 100 ml of normal saline or $D_5W$; gently shake until clear; final concentration 4.2 mg/ml (50 ml infusion bag) or 2.3 mg/ml (100 ml infusion bag)
- **Storage:** Reconstituted suspensions may be held in vial for up to 1 hr prior to transfer and dilution in the infusion bag. Including storage and infusion time, diluted infusion solutions are stable for up to 12 hr (NS) or 4 hr ($D_5W$) at controlled

room temperature; diluted infusion solutions are stable for up to 72 hr (NS) or 24 hr ($D_5W$) refrigerated, do not freeze reconstituted solutions.
• If Baxter Minibag Plus infusion bags are to be used, consult the instructions provided by the infusion bag manufacturer

**Intermittent IV infusion route**
• Do not mix with or physically add to solutions containing other drugs, infuse over 1 hr

**Solution compatibilities:** $D_5W$, 0.9% NaCl, sterile water for inj

**Y-site compatibilities:** Acyclovir, amikacin, aminophylline, amiodarone, anidulafungin, atropine, azithromycin, bumetanide, calcium gluconate, CARBOplatin, caspofungin, ceftaroline, ceftobiprole, cimetidine, ciprofloxacin, CISplatin, cyclophosphamide, cycloSPORINE, DAPTOmycin, dexamethasone, digoxin, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, DOXOrubicin, enalaprilat, esmolol, esomeprazole, etoposide, famotidine, fentaNYL, fluconazole, fluorouracil, foscarnet, furosemide, gemcitabine, gentamicin, granisetron, heparin, hydrocortisone, HYDROmorphone, ifosfamide, insulin (regular), labetalol, levofloxacin, linezolid, LORazepam, magnesium sulfate, mannitol, meperidine, methotrexate, methylPREDNISolone, metoclopramide, metroNIDAZOLE, micafungin, midazolam, milrinone, morphine, moxifloxacin, norepinephrine, ondansetron, PACLitaxel, pantoprazole, PHENobarbital, phenylephrine, potassium chloride, raNITIdine, sodium bicarbonate/phosphates, tacrolimus, telavancin, tigecycline, tobramycin, vancomycin, voriconazole, zidovudine

## ADVERSE EFFECTS

**CNS:** Seizures, headache
**GI:** *Diarrhea, nausea,* vomiting, pseudomembranous colitis, hepatitis
**GU:** Renal impairments/failure
**HEMA:** Neutropenia, leukopenia, anemia
**INTEG:** *Rash,* urticaria, phlebitis, erythema at inj site, Stevens-Johnson syndrome, toxic epidermal necrolysis, pruritus
**RESP:** Pneumonitis (inhalation)
**SYST:** Anaphylaxis, Stevens-Johnson syndrome, toxic epidermal necrolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | To most body fluids/tissue |
| **Metabolism** | Unknown |
| **Excretion** | Mainly unchanged in urine, 70% recovered in 48 hr |
| **Half-life** | 1 hr, extended in renal disease |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Probenecid: increased doripenem plasma levels
Divalproex sodium, valproic acid: decreased effects

### Drug/lab test

Increased: AST, ALT, LDH, BUN, alkaline phosphatase, bilirubin, creatinine
False positive: direct Coombs' test

## NURSING CONSIDERATIONS

### Assessment

• Assess sensitivity to carbapenem antibiotics, penicillins, cephalosporins, other beta lactams
• Monitor renal disease: lower dose may be required
• **Pseudomembranous colitis:** Monitor bowel pattern daily, diarrhea, abdominal cramps, fever; if severe diarrhea occurs, product should be discontinued; may indicate pseudomembranous colitis
• **Monitor for infection:** temp, sputum, characteristics of wound, before, during, and after treatment
• **Monitor for allergic reactions, anaphylaxis:** rash, urticaria, pruritus; may occur few days after therapy begins, discontinue, notify prescriber, have emergency equipment nearby
• **Monitor overgrowth of infection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum
• **Pregnancy/breastfeeding:** Use only if clearly needed, likely safe in breastfeeding

### Patient/family education

• Instruct patient to report severe diarrhea with abdominal cramping, fever; may indicate pseudomembranous colitis
• Instruct patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
• Instruct patient to report overgrowth of infection: black, furry tongue; vaginal itching; foul-smelling stools
• Advise patient to avoid breastfeeding; product is excreted in breast milk

### Evaluation

**Positive therapeutic outcome**
• Negative C&S
• Absence of symptoms and signs of infection

**TREATMENT OF HYPERSENSITIVITY:** EPINEPHrine, antihistamines; resuscitate if needed (anaphylaxis)

## dorzolamide ophthalmic

*See Appendix B*

## doxazosin (Rx)

(dox-ay′zoe-sin)
**Cardura, Cardura XL**
*Func. class.:* Peripheral α-adrenergic blocker, antihypertensive
*Chem. class.:* Quinazoline

**Do not confuse:** Cardura/Coumadin/Cardene/Ridaura

**ACTION:** Peripheral blood vessels are dilated, peripheral resistance lowered; reduction in B/P results from peripheral α-adrenergic receptors being blocked

**Therapeutic outcome:** Decreased B/P, decreased symptoms of benign prostatic hypertrophy (BPH)

**USES:** Hypertension, urinary outflow obstruction, symptoms of benign prostatic hyperplasia

## CONTRAINDICATIONS

Hypersensitivity to quinazolines

**Precautions:** Pregnancy, breastfeeding, children, hepatic disease, geriatrics

## DOSAGE AND ROUTES

### BPH

**Adult:** PO 1 mg/day at bedtime, increase in stepwise manner to 2, 4, 8 mg/day as needed at 1-2 wk intervals, max 8 mg; ext rel tab (Cardura XL) 4 mg/day with breakfast, adjust dose q3-4wk up to 8 mg/day

### Hypertension

**Adult:** PO 1 mg/day at bedtime, increasing up to 16 mg daily if required; usual range 4-16 mg/day
**Geriatric:** PO 0.5 mg nightly, gradually increase

**Available forms:** Tabs 1, 2, 4, 8 mg; ext rel tabs 4, 8 mg

### Implementation

**PO route**

- **Tabs** broken, crushed, or chewed; chewed tabs taste bitter; do not break, crush, chew **XL tabs**
- **Immediate release tab:** give without regard to meals; **EXT REL tabs:** give with breakfast; when switching from immediate release to EXT REL, the final evening dose of immediate release should be taken
- Store in tight container at room temperature (86° F [30° C] or less)
- May be used in combination with other antihypertensives
- May be given with food to prevent GI symptoms

## ADVERSE EFFECTS

**CNS:** *Dizziness,* headache, drowsiness, anxiety, depression, vertigo, weakness, fatigue, asthenia, syncope
**CV:** Palpitations, *orthostatic hypotension,* tachycardia, *edema,* dysrhythmias, chest pain
**EENT:** Epistaxis, tinnitus, dry mouth, red sclera, pharyngitis, rhinitis
**GI:** *Nausea,* vomiting, diarrhea, constipation, abdominal pain, hepatitis
**GU:** Incontinence, polyuria, priapism, impotence, decreased libido

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Not known; 98% plasma protein bound |
| **Metabolism** | Liver, extensively (<63%) |
| **Excretion** | Kidneys |
| **Half-life** | 22 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 2 hr |
| **Peak** | 2-3 hr |
| **Duration** | up to 24 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased hypotensive effects

### Drug classifications

NSAIDs, estrogens, sympathomimetics: decrease: hypotensive effects
Other antihypertensives, nitrates, PDE-5 inhibitors, dose may need adjustment: increased hypotensive effects

## NURSING CONSIDERATIONS

### Assessment

- **Hypertension:** monitor B/P (lying, standing) and pulse, syncope; check for edema in feet, legs daily; I&O; monitor for weight daily; notify prescriber of changes
- **BPH:** urinary pattern changes (hesitancy, dribbling, incomplete bladder emptying, dysuria, urgency, nocturia, urgency incontinence, intermittency before and during treatment)
- Assess for orthostatic hypotension; tell patient to rise slowly from sitting or lying position; assess pulse, jugular venous distention q4hr, crackles, dyspnea, orthopnea with B/P

• **Pregnancy/breastfeeding:** No well-controlled studies, use only if clearly needed, use cautiously in breastfeeding

### Patient/family education

• Teach patient not to discontinue product abruptly; emphasize the importance of complying with dosage schedule, even if feeling better; if dose is missed take as soon as remembered; take at same time each day
• Teach patient not to use OTC products (cough, cold, allergy) unless directed by prescriber; also to avoid large amounts of caffeine
• Emphasize the need to rise slowly to sitting or standing position to minimize orthostatic hypotension
• Teach patient to notify prescriber of mouth sores, sore throat, fever, swelling of hands or feet, irregular heartbeat, chest pain
• Caution patient to report excessive perspiration, dehydration, vomiting, diarrhea; may lead to fall in B/P
• Caution patient that product may cause dizziness, fainting, light-headedness; may occur during 1st few days of therapy; to avoid hazardous activities
• Teach patient how to take B/P, and normal readings for age-group; to take B/P q7days
• Inform patient that fainting occasionally occurs after 1st dose; do not drive or operate machinery for 4 hr after 1st dose or after dosage increase or take 1st dose at bedtime; may take 1-2 wk in BPH
• Teach patient to comply with hypertension regimen, low-sodium diet, exercise, weight reduction, stress management, not to smoke
• Teach patient how to take B/P to check at least once/wk
• Teach patient to notify all health care providers of all RX, OTC, and herbal supplements; not to add any products unless approved by prescriber
• Teach patient to avoid hazardous activities until response is known, dizziness or drowsiness may occur
• Teach patient to continue to take product even if feeling better, take at same time each day, do not take double doses

### Evaluation

**Positive therapeutic outcome**

• Decreased B/P in hypertension
• Decreased symptoms of BPH

## TREATMENT OF OVERDOSE:

Administer volume expanders or vasopressors; discontinue product; place in supine position

**⚠ HIGH ALERT**

## doxepin (Rx)

(dox′e-pin)
**Prudoxin Cream, Silenor 🍁, SINEquan 🍁, Zonolon Topical Cream**
*Func. class.:* Antidepressant, tricyclic; antianxiety
*Chem. class.:* Dibenzoxepin, tertiary amine

D

**ACTION:** Blocks reuptake of norepinephrine, serotonin into nerve endings, increasing action of norepinephrine, serotonin in nerve cells; has anticholinergic effects

**Therapeutic outcome:** Decreased symptoms of depression after 2-3 wk

**USES:** Major depression, anxiety, topical: lichen simplex, atopic dermatitis, eczema, insomnia

**Unlabeled uses:** Migraine prophylaxis; topical: pruritus

## CONTRAINDICATIONS

Hypersensitivity to tricyclics, urinary retention, closed-angle glaucoma, prostatic hypertrophy, acute recovery from MI

**Precautions:** Pregnancy, breastfeeding, geriatric, seizures

**BLACK BOX WARNING:** Suicidal patients, children

## DOSAGE AND ROUTES

### Depression/anxiety

**Adult:** PO 50-75 mg/day, may increase to 300 mg/day for severely ill, give in divided doses if >150 mg/day
**Geriatric:** PO 25-50 mg at bedtime, increase qwk by 25-50 mg to desired dose, max 150 mg/day

### Pruritus

**Adult:** PO 10 mg at bedtime, may increase to 25 mg at bedtime; TOP apply a thin film qid ≥3 hr apart

### Insomnia (Silenor)

**Adult:** PO 6 mg, 30 min before bedtime, 3 mg may be sufficient, max 6 mg/night

**Available forms:** Caps 10, 25, 50, 75, 100, 150 mg; oral conc 10 mg/ml; cream 5%; tabs (Silenor) 3, 6 mg

### Implementation

• **Oral conc** should be diluted with 120 ml of water, milk, or orange, grapefruit, tomato, prune, pineapple juice; do not mix with grape juice

• Give with food or milk for GI symptoms; do not give with carbonated beverages
• Give dose at bedtime if oversedation occurs during day; may take entire dose at bedtime; geriatric may not tolerate once/day dosing
• Store at room temperature; do not freeze
• Provide safety measures, primarily for geriatric
• Store in tight container protected from direct sunlight
• **Topical:** apply to affected area; rub slightly, do not use occlusive dressing

## ADVERSE EFFECTS

**CNS:** *Dizziness, drowsiness,* confusion, headache, anxiety, tremors, stimulation, weakness, insomnia, nightmares, EPS (geriatric), increased psychiatric symptoms, paresthesia, suicidal ideation
**CV:** *Orthostatic hypotension, ECG changes,* tachycardia, *hypertension,* palpitations, dysrhythmias
**EENT:** *Blurred vision,* tinnitus, mydriasis, ophthalmoplegia, glossitis
**GI:** *Diarrhea, dry mouth,* nausea, vomiting, paralytic ileus, increased appetite, cramps, epigastric distress, jaundice, hepatitis, stomatitis, constipation
**GU:** *Retention,* acute renal failure
**HEMA:** Agranulocytosis, thrombocytopenia, eosinophilia, leukopenia, pancytopenia, purpuric disorder
**INTEG:** Rash, urticaria, sweating, pruritus, photosensitivity

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Liver, extensively by CYP2C19/CYP2D6 7% of patients are poor metabolizers |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 8-24 hr |

### Pharmacodynamics

**PO:** Peak 2 hr

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
Cimetidine, FLUoxetine, fluvoxaMINE, PARoxetine, sertraline: increased doxepin effect
CloNIDine: increased hypertensive crisis; do not use together
EPINEPHrine, norepinephrine: increased hypertensive action

### Drug classifications

Antiarrhythmics, 1C (propafenone, flecainide), class III, quinolones: increased QT interval
Anticholinergics: increased anticholinergic effect
Barbiturates, benzodiazepines, CNS depressants, sedative/hypnotics: increased CNS depression
MAOIs: hypertensive crisis, seizures, hyperpyretic crisis
SSRIs, SNRIs, serotonin receptor agonists, triptans: increased toxicity

### Drug/herb

St. John's wort: increased serotonin syndrome, avoid using together

### Drug/lab test

Increased: serum bilirubin, blood glucose, alkaline phosphatase, LFTs

## NURSING CONSIDERATIONS

### Assessment

• **Assess chronic pain:** location, severity, type, alleviating/aggravating factors before and during treatment
• **Sexual dysfunction: Assess for decreased libido, erectile dysfunction may occur**
• Monitor B/P (with patient lying, standing), pulse q4hr; if systolic B/P drops 20 mm Hg, hold product, notify prescriber; take VS q4hr in patients with CV disease
• Monitor blood studies: CBC, leukocytes, differential, cardiac enzymes if patient is receiving long-term therapy
• Monitor liver function tests: AST, ALT, bilirubin
• Check weight weekly; appetite may increase with product
• Assess ECG for flattening of T wave, bundle branch block, AV block, dysrhythmias in cardiac patients; product should be discontinued gradually several days before surgery
• Assess for EPS primarily in geriatric: rigidity, dystonia, akathisia
• **Assess depression:** mood, sensorium, affect, suicidal tendencies; increase in psychiatric symptoms, assess often during initial treatment, restrict the amount of the product given to the patient
• Monitor urinary retention, constipation; constipation is more likely to occur in children or geriatric
• **Assess for withdrawal symptoms:** headache, nausea, diarrhea, agitation, hallucination, hyperthermia, incoordination, vomiting, muscle pain, weakness; do not usually occur unless product was discontinued abruptly
• Identify alcohol consumption; if alcohol is consumed, hold dose until AM

• **Beers:** Avoid use in older adults, highly anticholinergic, sedating, causes orthostatic hypotension, may cause delirium
• **Serotonin syndrome:** May occur when used with other products known to cause serotonin syndrome
• **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh risks, cautious use in breastfeeding, excreted in breast milk

### Patient/family education

• Tell patient that therapeutic effects of decreased depression may take 2-3 wk, antianxiety effects sooner; to use caution in driving and other activities requiring alertness because of drowsiness, dizziness, blurred vision
• Advise patient to avoid rising quickly from sitting to standing, especially geriatric
• Teach patient to avoid alcohol ingestion, other CNS depressants: may potentiate effects; not to discontinue medication quickly after long-term use: may cause nausea, headache, malaise
• Teach patient to wear sunscreen or large hat, since photosensitivity occurs
• Teach patient that clinical worsening and suicidal ideation may occur
• Teach patient to increase fluids, bulk in diet if constipation occurs, especially geriatric; to take gum, hard sugarless candy, or frequent sips of water for dry mouth
• Teach patient to report urinary retention immediately

### Evaluation

**Positive therapeutic outcome**

• Decrease in depression
• Absence of suicidal thoughts

**TREATMENT OF OVERDOSE:** ECG monitoring, induce emesis, lavage, administer anticonvulsant

## doxercalciferol

*See Vitamin D*

⚠ **HIGH ALERT**

## DOXOrubicin

(dox-oh-roo'bi-sin)

**Adriamycin**

*Func. class.:* Antineoplastic, antibiotic
*Chem. class.:* Anthracycline glycoside

**Do not confuse:** DOXOrubicin/DOXOrubicin liposomal/DAUNOrubicin

**ACTION:** Inhibits DNA synthesis primarily; replication is decreased by binding to DNA, which causes strand splitting; active throughout entire cell cycle; a vesicant

**USES:** Wilms' tumor; bladder, breast, lung, ovarian, stomach, thyroid cancer; Hodgkin's/non-Hodgkin's disease; acute lymphoblastic leukemia; myeloblastic leukemia; neuroblastomas; soft tissue/bone sarcomas

**CONTRAINDICATIONS:** Pregnancy 1st trimester, breastfeeding, hypersensitivity, systemic infections, cardiac disorders, severe myelosuppression, lifetime dose of 550 mg/m$^2$

**BLACK BOX WARNING:** Hepatic disease

**Precautions:** Accidental exposure, cardiac disease, dental work, electrolyte imbalance, infection, hyperuricemia

**BLACK BOX WARNING:** Bone marrow suppression, extravasation, heart failure, secondary malignancy; requires an experienced clinician, IM/SUBCUT use

## DOSAGE AND ROUTES

**Adult: IV** 60-75 mg/m$^2$ q3wk, or may be used in combination with other antineoplastics with 40-75 mg/m$^2$ q21-28d, max cumulative dose 550 mg/m$^2$ or 450 mg/m$^2$ if prior DAUNOrubicin, cyclophosphamide, mediastinal XRT

### Hepatic dose

**Adult:** IV Bilirubin 1.2-3 mg/dl, give 50% of dose; bilirubin 3.1-5 mg/dl, give 25% of dose

### Renal dose

**Adult:** IV CCr <10 ml/min give 75% of dose

**Available forms:** Powder for inj 10, 20, 50 mg; inj 2 mg/ml

### Implementation

**IV route**

• Give antiemetic 30-60 min before product to prevent vomiting
• Give allopurinol or sodium bicarbonate to maintain uric acid levels, alkalization of urine
• **Use cytotoxic handling procedures:** inspect for particulate and discoloration before use

**BLACK BOX WARNING:** Do not give IM, subcut

**BLACK BOX WARNING:** If extravasation occurs, stop inf and complete via another vein, preferably in another limb, use dexrazoxane topically

- Aluminum needles may be used during administration; avoid aluminum during storage
- Rapid injection can cause facial flushing or erythema along the vein

**Reconstitution:**

- To avoid risks with reconstitution, the commercially available injection may be used; there are still risks involved in handling the injection
- Do not use diluents containing preservatives to reconstitute powder for injection
- Reconstitute 10, 20, 50, 100 mg of DOXOrubicin with 5, 10, 25, 50 ml, respectively, of nonbacteriostatic NS injection (2 mg/ml), shake until completely dissolved; use reconstituted solution within 24 hr; do not expose to sunlight
- **IV injection:** Inject reconstituted solution over 0.3-5 min via Y-site or 3-way stopcock into a free-flowing IV inf of NS or $D_5W$; a butterfly needle inserted into a large vein is preferred

**BLACK BOX WARNING:** Care should be taken to avoid extravasation because the drug is extremely irritating to extravascular tissue

- Increased fluid intake to 2-3 L/day to prevent urate, calculi formation
- Store at room temperature for 24 hr after reconstituting

**Y-site compatibilities:** Alemtuzumab, alfentanil, amifostine, amikacin, anidulafungin, argatroban, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, carmustine, caspofungin, ceftizoxime, chlorproMAZINE, cimetidine, ciprofloxacin, CISplatin, cladribine, clindamycin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doripenem, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, gemcitabine, gentamicin, granisetron, haloperidol, hydrocortisone, HYDROmorphone, ifosfamide, imipenem cilastatin, inamrinone, isoproterenol, ketorolac, labetalol, leucovorin, levorphanol, lidocaine, linezolid, LORazepam, mannitol, mechlorethamine, melphalan, meperidine, mesna, methotrexate, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, mitoMYcin, morphine, nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, octreotide, ofloxacin, ondansetron, oxaliplatin, PACLitaxel, palonosetron, pancuronium, phenylephrine, potassium chloride, procainamide, prochlorperazine, promethazine, propranolol, quinupristin-dalfopristin, raNITIdine, sargramostim, sodium acetate, tacrolimus, teniposide, theophylline, thiotepa, ticarcillin/clavulanate, tigecycline, tirofiban, tobramycin, topotecan, trastuzumab, trimethobenzamide, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CV:** Increased B/P, sinus tachycardia, PVCs, chest pain, bradycardia, extrasystoles, irreversible cardiomyopathy, acute left ventricular failure

**GI:** *Nausea, vomiting,* anorexia, *mucositis,* hepatotoxicity

**GU:** Impotence, sterility, amenorrhea, gynecomastia, hyperuricemia, urine discoloration

**HEMA:** Thrombocytopenia, leukopenia, anemia

**INTEG:** *Rash,* necrosis at inj site, radiation recall, dermatitis, reversible *alopecia,* cellulitis, thrombophlebitis at inj site

**SYST:** Anaphylaxis, secondary malignancy

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete |
| **Distribution** | Crosses placenta |
| **Metabolism** | Liver |
| **Excretion** | Urine, bile, breast milk |
| **Half-life** | 30 min, terminal 16.5 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

CycloSPORINE, mercaptopurine: increased toxicity

Fluconazole, posaconazole: increased life-threatening dysrhythmias: do not use together

Fosphenytoin, phenytoin: increased effect of these drugs

Hematopoietic progenitor cell: decreased antineoplastic effect; do not use 24 hr before or after treatment

PACLitaxel: decreased clearance of DOXOrubicin

PHENobarbital: decreased DOXOrubicin effect
Progesterone: increased neutropenia, thrombocytopenia
Streptozocin: increased DOXOrubicin effect

### Drug classifications

Antineoplastics, radiation: increased toxicity
Calcium channel blockers: increased cardiomyopathy
Drugs that increase QT prolongation: increased effect
Live virus vaccine: decreased antibody response

### Drug/lab test

Increased: uric acid

## NURSING CONSIDERATIONS

### Assessment:

**BLACK BOX WARNING: Bone marrow depression:** CBC, differential, platelet count weekly; withhold or reduce dose of product if WBC is $<1500/mm^3$ or platelet count is $<50,000/mm^3$; notify prescriber of these results

- Renal studies: BUN, serum uric acid, urine CCr, electrolytes before, during therapy
- I&O ratio: Report fall in urine output to <30 ml/hr
- Monitor temperature: Fever might indicate beginning infection
- **Hepatotoxicity:** hepatic studies before, during therapy: bilirubin, AST, ALT, alk phos as needed or monthly; check for jaundice of skin and sclera, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea

**BLACK BOX WARNING: Dysrhythmias:** ECG; watch for ST-T wave changes, low QRS and T, possible dysrhythmias (sinus tachycardia, heart block, PVCs), ejection fraction before treatment, signs of irreversible cardiomyopathy, can occur up to 6 mo after treatment begins

- **Bleeding:** hematuria, guaiac, bruising, petechiae of mucosa or orifices every 8 hr
- Effects of alopecia on body image; discuss feelings about body changes; almost total alopecia is expected

**BLACK BOX WARNING: Secondary malignancy:** Assess for acute myelogenous leukemia (AML) and myelodysplastic syndrome (MDS)

- Buccal cavity every 8 hr for dryness, sores, ulceration, white patches, oral pain, bleeding, dysphagia
- Alkalosis if severe vomiting is present

**BLACK BOX WARNING: Extravasation:** local irritation, pain, burning at inj site; a vesicant; if extravasation occurs, stop drug, restart at another site, apply ice, elevate extremity to reduce swelling; if resolution does not occur, surgical debridement may be required

- GI symptoms: frequency of stools, cramping
- Rinsing of mouth tid-qid with water, club soda; brushing of teeth bid-tid with soft brush or cotton-tipped applicators for stomatitis; use unwaxed dental floss

### Patient/family education

- Instruct patient to add 2-3 L of fluids unless contraindicated before and for 24-48 hr after to decrease possible hemorrhagic cystitis
- Instruct patient to report any complaints, side effects to nurse or prescriber
- Advise patient that hair may be lost during treatment; that wig or hairpiece might make patient feel better; that new hair might be different in color, texture
- Instruct patient to avoid foods with citric acid, hot or rough texture
- Instruct patient to report any bleeding, white spots, ulcerations in mouth to prescriber; to examine mouth daily
- Advise patient that urine, other body fluids may be red-orange for 48 hr
- Instruct patient to avoid crowds and persons with infections when granulocyte count is low
- **Pregnancy/breastfeeding:** Advise patient that barrier contraceptive measures are recommended during therapy and for 4 mo after to avoid breastfeeding
- Instruct patient to avoid vaccinations

### Evaluation

#### Positive therapeutic outcome

- Decreased tumor size, decreased spread of malignancy

**⚠ HIGH ALERT**

## DOXOrubicin liposomal

(dox-oh-roo'bi-sin)
**Doxil, Lipodex**
*Func. class.:* Antineoplastic, antibiotic
*Chem. class.:* Anthracycline glycoside

**Do not confuse:** DOXOrubicin liposomal/ DOXOrubicin/DAUNOrubicin

**ACTION:** Inhibits DNA synthesis primarily; replication is decreased by binding to DNA, which causes strand splitting; active throughout entire cell cycle; a vesicant

**USES:** AIDS-related Kaposi's sarcoma, multiple myeloma, metastatic ovarian carcinoma

## CONTRAINDICATIONS:

Pregnancy, breastfeeding, hypersensitivity

**Precautions:** Children, infection, leukopenia, stomatitis, thrombocytopenia, cardiotoxicity, inf reactions, myelosuppression, hepatic disease, systemic infections, cardiac disorders

## DOSAGE AND ROUTES

Max lifetime cumulative dose 550 mg/m$^2$; 400 mg/m$^2$ for those who have received other cardiotoxics or mediastinal radiation

### Kaposi's sarcoma

**Adult: IV** 20 mg/m$^2$ q3wk

### Multiple myeloma

**Adult: IV** 30 mg/m$^2$ IV inf on day 4 every 3 wk plus bortezomib 1.3 mg/m$^2$/dose IV bolus on days 1, 4, 8, 11 of each cycle; give DOXOrubicin liposomal after bortezomib receipt on day 4; administer up to 8 treatment cycles or until disease progression or unacceptable toxicity occurs

### Breast cancer, metastatic (unlabeled)

**Adult: IV** 50 mg/m$^2$ day 1, q4wk

**Available forms:** Liposomal dispersion for inj: 2 mg/ml

### Implementation

- Prepared liposomal DOXOrubicin is a translucent, red liposomal dispersion; visually inspect for particulate matter and discoloration before use
- Pegylated liposomal DOXOrubicin (Doxil) is for IV INF use only and should not be given IM/subcut, give under the supervision of a physician who is experienced in cancer chemotherapy

**BLACK BOX WARNING:** Care should be taken to avoid extravasation because the drug is irritating to extravascular tissue

- Premedication with antiemetics is recommended

**IV route**

- **Reconstitution (Doxil):** dilute the appropriate dose, not to exceed 90 mg/250 ml $D_5W$; do not mix with any other diluent, drugs, or bacteriostatic agent, use aseptic technique; product contains no preservative or bacteriostatic agent; diluted solution must be refrigerated and used within 24 hr
- **IV INF (Doxil):** do not administer as a bolus injection or an undiluted solution; rapid injection can increase the risk of an inf-related reaction
- An acute inf reaction can occur during the first inf and is usually resolved by slowing the rate of inf; most patients can tolerate subsequent inf
- **Rate:** infuse at an initial rate of 1 mg/min; if no inf-related action, the rate can be increased to complete the inf over 1 hr; do not filter
- For hematologic toxicity in patients with ovarian cancer or HIV-related Kaposi's sarcoma: Grade 1 (ANC of 1500-1900/mm$^3$, platelets ≥75,000/mm$^3$): No dose reduction; Grade 2 (ANC of 1000-1499/mm$^3$, platelets ≥50,000/mm$^3$ and <75,000/mm$^3$: Wait until ANC ≥1500 cells/mm$^3$ and platelets ≥75,000 cells/mm$^3$; redose with no dose reduction; Grade 3 (ANC of 500-999/mm$^3$, platelets ≥25,000/ mm$^3$ and <50,000/mm$^3$): Wait until ANC ≥1500 cells/mm$^3$ and platelets ≥75,000 cells/mm$^3$; redose with no dose reduction; Grade 4 (ANC <500/mm$^3$, platelets <25,000/mm$^3$): Wait until ANC ≥1500 cells/mm$^3$ and platelets ≥75,000 cells/mm$^3$; reduce dose by 25% or continue with full dose with colony-stimulating factor
- Give antiemetic 30-60 min before product to prevent vomiting
- Use allopurinol or sodium bicarbonate to maintain uric acid levels, alkalinization of urine
- Avoid mixing with other products
- Increase fluid intake to 2-3 L/day to prevent urate, calculi formation
- Store refrigerated for 24 hr after reconstituting

## ADVERSE EFFECTS

**CNS:** Paresthesias, headache, depression, insomnia, fatigue, fever

**CV:** Chest pain, decreased B/P, cardiomyopathy, heart failure, dysrhythmias, tachycardia

**EENT:** Optic neuritis, rhinitis, pharyngitis, stomatitis

**GI:** *Nausea, vomiting,* anorexia, *mucositis,* hepatotoxicity, constipation, oral candidiasis, abdominal pain

**HEMA:** Thrombocytopenia, leukopenia, anemia, neutropenia, secondary malignancy

**INTEG:** *Rash,* necrosis at inj site, dermatitis, reversible *alopecia,* exfoliative dermatitis, palmar-plantar erythrodysesthesia, thrombophlebitis at inj site

**RESP:** Dyspnea, cough, respiratory infections

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete |
| **Distribution** | Crosses placenta |
| **Metabolism** | Liver |
| **Excretion** | Urine, bile, breast milk |
| **Half-life** | 55 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

CycloSPORINE, mercaptopurine: increased toxicity
Fluconazole, posaconazole: increased life-threatening dysrhythmias: do not use together
Fosphenytoin, phenytoin: increased effect of these drugs
Hematopoietic progenitor cell: decreased antineoplastic effect; do not use 24 hr before or after treatment
PACLitaxel: decreased clearance of DOXOrubicin
PHENobarbital: decreased DOXOrubicin effect
Progesterone: increased neutropenia, thrombocytopenia
Streptozocin: increased DOXOrubicin effect

### Drug classifications

Antineoplastics, radiation: increased toxicity
Calcium channel blockers: increased cardiomyopathy
Drugs that increase QT prolongation: increased effect
Live virus vaccine: decreased antibody response

### Drug/lab test

Increased: uric acid

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Bone marrow depression:** CBC, differential, platelet count weekly; withhold or reduce dose of product if WBC is $<1500/mm^3$ or platelet count is $<50,000/mm^3$; notify prescriber of these results

- Renal studies: BUN, serum uric acid, urine CCr, electrolytes before, during therapy
- I&O ratio: Report fall in urine output to <30 ml/hr
- Monitor temperature: Fever might indicate beginning infection
- **Hepatotoxicity:** hepatic studies before, during therapy: bilirubin, AST, ALT, alk phos as needed or monthly; check for jaundice of skin and sclera, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea

**BLACK BOX WARNING: Dysrhythmias:** ECG; watch for ST-T wave changes, low QRS and T, possible dysrhythmias (sinus tachycardia, heart block, PVCs), ejection fraction before treatment, signs of irreversible cardiomyopathy, can occur up to 6 mo after treatment begins

- Bleeding: hematuria, guaiac, bruising, petechiae of mucosa or orifices every 8 hr
- Effects of alopecia on body image; discuss feelings about body changes; almost total alopecia is expected
- Inflammation of mucosa, breaks in skin
- Buccal cavity every 8 hr for dryness, sores, ulceration, white patches, oral pain, bleeding, dysphagia
- Alkalosis if severe vomiting is present

**BLACK BOX WARNING: Extravasation:** local irritation, pain, burning at inj site; a vesicant; if extravasation occurs, stop drug, restart at another site, apply ice, elevate extremity to reduce swelling; if resolution does not occur, surgical debridement may be required

- **Secondary malignancy:** Assess for acute myelogenous leukemia and oral cancer
- GI symptoms: frequency of stools, cramping
- Rinsing of mouth tid-qid with water, club soda; brushing of teeth bid-tid with soft brush or cotton-tipped applicators for stomatitis; use unwaxed dental floss

### Patient/family education

- Instruct patient to add 2-3 L of fluids unless contraindicated before and for 24-48 hr after to decrease possible hemorrhagic cystitis
- Instruct patient to report any complaints, side effects to nurse or prescriber
- Advise patient that hair may be lost during treatment; that wig or hairpiece might make patient feel better; that new hair might be different in color, texture
- Instruct patient to avoid foods with citric acid, hot or rough texture
- Instruct patient to report any bleeding, white spots, ulcerations in mouth to prescriber; to examine mouth daily
- Advise patient that urine, other body fluids may be red-orange for 48 hr
- Instruct patient to avoid crowds and persons with infections when granulocyte count is low
- **Pregnancy/breastfeeding:** Advise patient that barrier contraceptive measures are recommended during therapy and for 4 mo after to avoid breastfeeding
- Instruct patient to avoid vaccinations because reactions can occur; to avoid alcohol

## Evaluation

**Positive therapeutic outcome**

• Decreased tumor size, decreased spread of malignancy

### doxycycline (Rx)

(dox-i-sye'kleen)

**Adoxa, Alsoxa, Apo-Doxy, Doryx, Doxy, Doxycaps, Doxycin, doxycycline calcium, doxycycline hyclate, doxycycline monohydrate, Monodox, Monohydrate, Oracea, Periostat, Vibramycin, Vibra-Tabs**

*Func. class.:* Antiinfective

*Chem. class.:* Tetracycline

**Do not confuse:** doxycycline/doxepin/dicyclomine

**ACTION:** Inhibits protein synthesis, phosphorylation in microorganisms by binding to 30S ribosomal subunits, reversibly binding to 30S ribosomal subunits; bacteriostatic

**Therapeutic outcome:** Bactericidal action against the following: gram-positive pathogens: *Bacillus anthracis, Clostridium perfringens, Clostridium tetani, Listeria monocytogenes, Nocardia, Propionibacterium acnes, Actinomyces israelii;* gram-negative pathogens *Haemophilus influenzae, Legionella pneumophila, Yersinia enterocolitica, Yersinia pestis, Neisseria gonorrhoeae, Neisseria meningitidis, Mycoplasma, Chlamydia*

**USES:** Syphilis, gonorrhea, lymphogranuloma venereum, uncommon gram-negative or gram-positive organisms, malaria prophylaxis, *Acinetobacter, Actinomyces israelii, Bacillus anthracis, Bacteroides, Balantidium coli, Bartonella bacilliformis, Borrelia recurrentis, Brucella, Campylobacter fetus, Chlamydia psittaci, Chlamydia trachomatis, Clostridium, Entamoeba histolytica, Enterobacter aerogenes, Enterococcus, Escherichia coli, Francisella tularensis, Fusobacterium fusiforme, Haemophilus ducreyi, Haemophilus influenzae* (beta-lactamase negative), *Haemophilus influenzae* (beta-lactamase positive), *Klebsiella granulomatis, Klebsiella, Leptospira, Listeria monocytogenes, Mycoplasma pneumoniae, Neisseria gonorrhoeae, Neisseria meningitidis, Orientia tsutsugamushi, Plasmodium falciparum, Propionibacterium acnes, Rickettsia akari, Rickettsia prowazekii, Rickettsia rickettsii, Shigella, Staphylococcus aureus* (MSSA), *Streptococcus pneumoniae, Streptococcus pyogenes* (group A beta-hemolytic streptococci), *Treponema pallidum, Treponema pertenue, Ureaplasma urealyticum, Vibrio cholerae,* viridans streptococci, *Yersinia pestis*

**Unlabeled uses:** Enterocolitis, biliary tract, intraabdominal infections; epididymitis *(Chlamydia trachomatis);* chronic prostatitis *(Ureaplasma urealyticum);* traveler's diarrhea (enterotoxigenic *Escherichia coli*); Legionnaire's disease *(Legionella pneumophila);* Lyme disease *(Borrelia burgdorferi),* Lyme disease (erythema migrans); Lyme arthritis; Lyme carditis; pleural effusion; malaria (chloroquine-resistant *Plasmodium falciparum*); pelvic inflammatory disease (PID), tubo-ovarian abscess in combination; acute dental infection, dentoalveolar infection, endodontic infection; aggressive juvenile periodontitis, plague prophylaxis *(Yersinia pestis);* tularemia prophylaxis *(Francisella tularensis);* Bancroft's filariasis (elephantiasis) *(Wuchereria bancrofti);* melioidosis due to *Burkholderia pseudomallei;* leptospirosis *(Leptospira);* infection prophylaxis for gynecologic procedures/surgical infection prophylaxis for hysterosalpingogram or chromotubation/induced abortion/dilation and evacuation; methicillin-resistant *Staphylococcus aureus* (MRSA)-associated bone and joint infections

## CONTRAINDICATIONS

Pregnancy, children <8 yr, esophageal ulceration, hypersensitivity to tetracyclines

**Precautions:** Hepatic disease, breastfeeding, pseudomembranous colitis, ulcerative colitis, sulfite hypersensitivity, excessive sunlight

## DOSAGE AND ROUTES

### Most infections

**Adult:** PO/**IV** 100 mg q12hr on day 1, then 100 mg/day; **IV** 200 mg in 1-2 INF on day 1, then 100-200 mg/day

**Child >8 yr (≥45 kg):** PO/**IV** 100 mg q12hr on day 1, then 100 mg/day; severe infections 100 mg q12hr; **IV** 200 mg on day 1, then 100-200 mg/day, give 200 mg dose as 1 or 2 infusions

**Child ≥8 yr, <45 kg:** PO 2.2 mg/kg q12hr on day 1, then 2.2 mg/kg/day, severe infections 2.2 mg/kg q12hr; **IV** 4.4 mg/kg divided on day 1, then 2.2-4.4 mg/kg/day in 1-2 divided doses

### Gonorrhea (uncomplicated) (patients allergic to penicillin)

**Adult:** PO 100 mg q12hr × 7 days, or 300 mg followed 1 hr later by another 300 mg

### Malaria prophylaxis

**Adult:** 100 mg/day 1-2 days before travel, daily during travel, and 4 wk after return

**Adolescent/child ≥8 yr <45 kg:** PO 2 mg/kg/day (up to 100 mg/day) begin 1-2 days before travel, continue for 4 wk after return

### Chlamydia trachomatis
**Adult:** PO 100 mg bid × 7 days

### Syphilis
**Adult:** PO 100 mg bid × 14 days

### Anthrax
**Adult and child >8 yr and ≥45 kg: IV** 100 mg q12hr, change to PO when able × 60 days
**Adolescent/child ≥8 yr and <45 kg:** PO 2.2 mg/kg q12hr × 60 days; **IV** 100 mg q12hr, change to PO when able × 60 days

### Lyme disease
**Adult:** PO 100 mg bid × 14-21 days

### Periodontitis
**Adult:** 20 mg bid after sealing and root planing for ≤9 mo; give close to meal AM or PM

**Available forms: Doxycycline:** cap 40 mg; **doxycycline calcium:** susp 50 mg/5 ml; **doxycycline hyclate:** cap 20, 50, 100 mg; del rel tab 75, 100, 150 mg; del rel cap 75, 100 mg; inj 100 mg; tabs 20, 100, mg; **doxycycline monohydrate:** caps 50, 100, 150 mg; tabs 50, 75, 100 mg; oral susp 25 mg/5 ml

### Implementation
**PO route**
- Do not break, crush, or chew caps
- Give around the clock to maintain proper blood levels; give with food to increase absorption of product; do not give within 3 hr of other agents; product reactions may occur
- Give with 8 oz of water 1 hr before bedtime to prevent ulceration
- Shake liquid preparation well before giving; use calibrated device for proper dosing
- Do not give with iron, calcium, magnesium products or antacids, which decrease absorption and form insoluble chelate
- **Del rel cap:** swallow whole or open and sprinkle on applesauce
- **Susp:** shake well, use calibrated device, may give with food/milk for GI irritation, store at room temperature, discard after 14 days

**Intermittent IV infusion route**
- Check for irritation, extravasation, phlebitis daily
- Dilute each 100 mg/10 ml or 200 mg/20 ml of 0.9% NaCl, sterile water for inj; each 100 mg must be further dilute in at least 100 ml of 0.9% NaCl, $D_5W$, Ringer's, LR, $D_5W$/LR; give over 1-4 hr
- Avoid rapid use, extravasation
- Store in tight, light-resistant container at room temperature; **IV** sol stable for 12 hr at room temperature, 72 hr if refrigerated; discard if precipitate forms

**Y-site compatibilities:** Acyclovir, alemtuzumab, alfentanil, amifostine, amikacin, aminophylline, amiodarone, anidulafungin, ascorbic acid, atracurium, atropine, aztreonam, bivalirudin, bumetanide, buprenorphine, butorphanol, calcium chloride, calcium gluconate, CARBOplatin, caspofungin, cefonicid, cefotaxime, cefTRIAXone, chlorproMAZINE, cimetidine, cisatracurium, CISplatin, clindamycin, codeine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexmedetomidine, digoxin, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doxacurium, DOXOrubicin, enalapril, ePHEDrine, EPINEPHrine, epiRUBicin, epoetin alfa, eftifibitide, ertapenem, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, gemcitabine, gentamicin, glycopyrrolate, granisetron, HYDROmorphone, IDArubicin, ifosfamide, imipenem/cilastatin, insulin, isoproterenol, labetalol, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, methyldopate, metoclopramide, metoprolol, metroNIDAZOLE, miconazole, midazolam, milrinone, mitoXANTRONE, morphine, multivitamins, nalbuphine, naloxone, nesiritide, netilmicin, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxaliplatin, oxytocin, PACLitaxel, pancuronium, pantoprazole, papaverine, pentamidine, pentazocine, perphenazine, phentolamine, phenylephrine, phytonadione, potassium chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, pyridoxine, quinupristin/dalfopristin, raNITIdine, remifentanil, ritodrine, riTUXimab, rocuronium, sargramostim, sodium acetate, streptokinase, succinylcholine, SUFentanil, tacrolimus, telavancin, teniposide, theophylline, thiamine, thiotepa, tirofiban, tobramycin, tolazoline, TPN (2 in 1), trastuzumab, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, voriconazole, zoledronic acid

**Y-site incompatibilities:** Allopurinol, amphotericin B colloidal, amphotericin B liposome, ampicillin, ampicillin/sulbactam, azaTHIOprine, ceFAZolin, cefoperazone, cefoTEtan, cefOXitin, ceftizoxime, cefuroxime, chloramphenicol, dantrolene, dexamethasone, diazePAM, diazoxide, erythromycin, fluorouracil, folic acid, furosemide, ganciclovir, heparin, hydrocortisone, inamrinone, indomethacin, ketorolac, methotrexate, methylPREDNISolone, mezlocillin, moxalactam, nafcillin, oxacillin, palonosetron, PEMEtrexed, penicillin G, PENTobarbital, PHENobarbital, phenytoin, piperacillin/tazobactam,

potassium acetate, sodium bicarbonate, trimethoprim/sulfamethoxazole

## ADVERSE EFFECTS

**CNS:** Fever, headache
**CV:** Pericarditis
**EENT:** Dysphagia, glossitis, decreased calcification of deciduous teeth, oral candidiasis, tooth discoloration
**GI:** *Nausea, abdominal pain, vomiting, diarrhea,* anorexia, enterocolitis, hepatotoxicity, flatulence, abdominal cramps, gastric burning, stomatitis
**GU:** *Increased BUN*
**HEMA:** Eosinophilia, neutropenia, thrombocytopenia, hemolytic anemia
**INTEG:** Rash, urticaria, photosensitivity, increased pigmentation, exfoliative dermatitis, pruritus, phlebitis, injection site reaction
**MS:** Bone growth retardation (child <8 yr), muscle, joint pain
**RESP:** Cough
**SYST:** Stevens-Johnson syndrome, angioedema, toxic epidermal necrolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed, crosses placenta |
| **Metabolism** | Some hepatic recycling, 90% protein binding |
| **Excretion** | Bile, feces; kidneys unchanged (20%-40%), enters breast milk |
| **Half-life** | 1 day; increased in severe renal disease |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | 1½-4 hr | Immediate |
| **Peak** | 1½-4 hr | Infusion's end |

## INTERACTIONS

### Individual drugs

Bismuth, calcium, carBAMazepine, cimetidine, cholestyramine, colestipol, kaolin/pectin, magnesium, $NaHCO_3$, phenytoin, RifAMPin, sucralfate, zinc: decreased effect of doxycycline
Digoxin: increased or decreased effect of digoxin, sevelamer
Iron: forms chelates, decreased absorption
Penicillins: decreased effects of penicillins
Warfarin: increased effect of warfarin

### Drug classifications

Alkali products, antacids, barbiturates: decreased effect of doxycycline
Anticoagulants (oral): increased effect of anticoagulants, methotrexate

### Drug/food

Decreased: absorption with dairy products

### Drug/lab test

Increased: BUN, alkaline phosphatase, bilirubin, amylase, ALT, AST, eosinophils, WBC
False increase: urinary catecholamines

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for previous sensitivity reaction
- **Assess patient for signs and symptoms of infection** including characteristics of wounds, sputum, urine, stool, WBC >10,000/$mm^3$, fever; obtain baseline information before, during treatment
- Obtain C&S before beginning product therapy to identify if correct treatment has been initiated
- **Assess for allergic reactions:** rash, urticaria, pruritus, chills, fever, joint pain; angioedema may occur a few days after therapy begins
- Assess bowel pattern daily; if severe diarrhea occurs, product should be discontinued
- Monitor for bleeding: ecchymosis, bleeding gums, hematuria, stool guaiac daily if on long-term therapy; blood dyscrasias may occur
- **Assess for overgrowth of infection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum
- **Pregnancy/breastfeeding:** No well-controlled studies, may affect skeletal development, do not use in the second half of pregnancy unless benefits outweigh fetal risk, discontinue breastfeeding or product, excreted in small amounts in breast milk

### Patient/family education

- Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
- Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate superinfection; report itching, rash, pruritus, urticaria
- Instruct patient to take all medication prescribed for the length of time ordered; product must be taken around the clock to maintain blood levels; do not give medication to others
- Advise patient to notify prescriber of diarrhea with blood or pus
- Teach patient not to use with antacids, iron products, $H_2$ blockers, sevelamer, calcium (milk), magnesium, zinc

• Advise patient to take with full glass of water, if nausea occurs take with food

### Evaluation

**Positive therapeutic outcome**

• Absence of signs/symptoms of infection (WBC $<10,000/mm^3$, temp WNL, absence of red draining wounds)
• Reported improvement in symptoms of infection

**⚠ HIGH ALERT REMS**

## dronedarone (Rx)

(drone-da-rone)
**Multaq**
*Func. class.:* Antidysrhythmic (Class III)
*Chem. class.:* Iodinated benzofuran derivative

**ACTION:** Prolongs action potential duration and effective refractory period, noncompetitive α- and β-adrenergic inhibition; increases PR and QT intervals, decreases sinus rate, decreases peripheral vascular resistance

**Therapeutic outcome:** Decreased amount and severity of ventricular dysrhythmias

**USES:** Atrial fibrillation, atrial flutter

## CONTRAINDICATIONS:

Pregnancy, breastfeeding, severe sinus node dysfunction, 2nd- or 3rd-degree AV block; bradycardia, hypersensitivity, heart failure, hepatic disease, QT prolongation

**BLACK BOX WARNING:** NYHA class IV heart failure or class II-III with recent decompensation requiring hospitalization, permanent atrial fibrillation (cannot restore sinus rhythm)

**Precautions:** Children, electrolyte imbalances, elderly, Asian patients, females, atrial fibrillation/flutter

## DOSAGE AND ROUTES

**Adult: PO** 400 mg bid; discontinue class I, III antidysrhythmias or strong CYP3A4 inhibitors prior to beginning treatment; max 800 mg/day
**Available forms:** Tabs 400 mg

### Implementation

• Start with patient hospitalized and monitored
**PO route**
• Give reduced dosage slowly with ECG monitoring only
• Give loading dose with food to decrease nausea

## ADVERSE EFFECTS

**CNS:** Weakness
**CV:** *Bradycardia,* heart failure, QT prolongation, torsades de pointes, atrial flutter
**ENDO:** Hypo/hyperthyroidism
**GI:** Nausea, vomiting, diarrhea, abdominal pain, severe hepatic injury, hepatic failure
**INTEG:** Rash, photosensitivity, angioedema
**RESP:** Interstitial pneumonitis, pulmonary fibrosis

D

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Slow, variable (PO) up to 65% |
| **Distribution** | Body tissues; crosses placenta |
| **Metabolism** | Liver |
| **Excretion** | Bile, kidney (minimal) |
| **Half-life** | 15-100 day |

### Pharmacodynamics

| | PO |
|---|---|
| **Onset** | 1-3 wk |
| **Peak** | Unknown |
| **Duration** | Up to months |

## INTERACTIONS

### Individual drugs

CycloSPORINE, dextromethorphan, digoxin, disopyramide, flecainide, methotrexate, phenytoin, procainamide, quiNIDine, theophylline: increased blood levels, increased toxicity
Dabigatran, warfarin: increased anticoagulant effect

### Drug classifications

β-Adrenergic blockers, calcium channel blockers: increased bradycardia
CYP3A4 inhibitors, CYP2D6 inhibitors: increased dronedarone levels
CYP3A, CYP2D6 inducers: decreased dronedarone levels

### Drug/herb

St. John's wort: decreased effect
Yohimbine: increased anticoagulant effect

### Drug/food

Grapefruit juice: increased dronedarone effect, avoid use

### Drug/lab test

Increased: T4, LFTs, bilirubin, creatinine
Decreased: potassium, magnesium

## NURSING CONSIDERATIONS

### Assessment

• Monitor I&O ratio; monitor electrolytes: potassium, creatinine, magnesium
• Monitor liver function studies: AST, ALT, bilirubin, alkaline phosphatase

**BLACK BOX WARNING:** NYHA Class IV heart failure or symptomatic heart failure with recent decomposition requiring hospitalization doubles risk of death

- Monitor **ECG** to determine product effectiveness; measure PR, QRS, QT intervals; check for PVCs, other dysrhythmias; monitor B/P continuously for hypo/hypertension; check for rebound hypertension after 1-2 hr
- Monitor serum creatine, potassium, magnesium
- Monitor for dehydration or hypovolemia
- **Assess for hypothyroidism:** lethargy, dizziness, constipation, enlarged thyroid gland, edema of extremities, cool, pale skin
- Monitor cardiac rate, respiration: rate, rhythm, character, chest pain, ventricular tachycardia, supraventricular tachycardia or fibrillation
- Assess sight and vision before treatment and throughout therapy; microdeposits on the cornea may cause blurred vision, halos, and photophobia

### Patient/family education

- Instruct patient to report weight gain, edema, difficulty breathing, fatigue, peripheral edema immediately to prescriber
- Instruct patient to use sunscreen and protective clothing to prevent burning associated with photosensitivity
- Instruct patient to take medication as prescribed, in AM, PM with meals not to double doses, avoid use with all other products without approval of prescriber, do not use grapefruit juice
- Instruct patient to complete follow-up appointment with health care provider, including pulmonary function studies, chest x-ray
- Teach patient to take consistently with or without food
- Teach patient not to take double doses
- **Pregnancy/breastfeeding:** Teach patient to use effective contraception during treatment, do not breastfeed

### Evaluation

**Positive therapeutic outcome**

- Decreased dysrhythmias

## TREATMENT OF OVERDOSE:

Administer $O_2$, artificial ventilation, ECG, DOPamine for circulatory depression

**⚠ HIGH ALERT**

# dulaglutide (Rx)

(doo-la-gloo′-tide)

**Trulicity**

*Func. class.:* Antidiabetic

*Chem. class.:* Incretin mimetic

## ACTION:

Binds and activates known human glucagon-like peptide-1 (GLP-1) receptor agonist, mimics natural physiology for self-regulating glycemic control

**Therapeutic outcome:** Decreased polyuria, polydipsia, polyphagia; improved Hgb A1C

## USES:

Type 2 diabetes mellitus, once-weekly dosing

## CONTRAINDICATIONS

Hypersensitivity

**BLACK BOX WARNING:** Medullary thyroid carcinoma, multiple endocrine neoplasia syndrome type 2 (men-2), thyroid cancer

**Precautions:** Pregnancy, breastfeeding, children, geriatric patients, severe renal/hepatic/GI disease, pancreatitis, vit D deficiency, burns, colitis, diarrhea, fever, GI bleeding/perforation/obstruction, ileus, infection, pseudomembranous colitis, thyroid disease, trauma, surgery, type 1 diabetes mellitus, tobacco smoking, vomiting

## DOSAGE AND ROUTES

**Adult: SUBCUT** 0.75 mg qwk, may increase to 1.5 mg qwk

**Available forms:** Inj 0.75 mg/0.5 ml, 1.5 mg/0.5ml

### Implementation

**SUBCUT route**

- Do not use as first-line therapy for those who have inadequate glycemic control on diet and exercise
- Administer the dose at any time of day, with or without meals
- If a dose is missed, take as soon as remembered, as long as the next dose is due at least 3 days later, If it is more than 3 days after the missed dose, wait until the next regularly scheduled dose
- Give by **SUBCUT** only; do not give **IV** or **IM**; inject into the thigh, abdomen, or upper arm; rotate sites with each inj to prevent lipodystrophy
- Properly dispose of the pen or syringe

• Store in refrigerator for unopened pen; may store at room temperature after opening for up to 30 days, do not freeze
• When using concomitantly with insulin, give as separate injections. Never mix them together. The two injections may be injected in the same body region, but not adjacent to each other
• **Pre-filled pen administration:** Part of pen is glass; if dropped on a hard surface, do not use; uncap the pen after checking that it is locked; place base flat and firmly; unlock by turning the lock ring, press and hold green button, click will be heard; continue holding until another click is heard; inj is complete when the gray plunger is visible, remove the pen, dispose of used pen

## ADVERSE EFFECTS

**CNS:** Fatigue
**ENDO:** Hypoglycemia
**GI:** Nausea, vomiting, diarrhea, anorexia, gastroesophageal reflux, pancreatitis, flatulence, abdominal pain, constipation
**SYST:** Secondary malignancy
**INTEG:** Injection-site reactions, rash, urticaria

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 5 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 24-72 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol, disopyramide: increased hypoglycemia
Dextrothyroxine, niacin, triamterene: decreased hypoglycemia efficacy

### Drug classifications

ACE inhibitors, anabolic steroids, androgens, fibric acid derivatives, sulfonylureas: increased hypoglycemia
Corticosteroids, phenothiazines: increased hyperglycemia
Estrogens, MAOIs, oral contraceptives, progestins, thiazide diuretics: decreased hypoglycemia

## NURSING CONSIDERATIONS

### Assessment

• Monitor fasting blood glucose, A1C levels, postprandial glucose during treatment to determine diabetes control
• **Pancreatitis:** severe abdominal pain, with/without vomiting; product should be discontinued
• Assess for hypo/hyperglycemic reaction that can occur soon after meals; for severe hypoglycemia give **IV** $D_5W$, then **IV** dextrose solution
• Assess for nausea, diarrhea, vomiting, ability to tolerate product, may cause dehydration

### Patient/family education

• Teach patient symptoms of hypo/hyperglycemia, what to do about each; to have glucagon emergency kit available; to carry a glucose source (candy, sugar cube) to treat hypoglycemia
• Advise patient that product must be continued on a weekly basis explain consequences of discontinuing product abruptly
• Teach patient that diabetes is a lifelong illness; product will not cure disease
• Advise patient to carry emergency ID
• Advise patient to continue weight control, dietary restrictions, exercise, hygiene
• Inform patient that regular blood glucose monitoring and A1C testing is needed
• Advise patient to notify prescriber if pregnant or intend to become pregnant
• **Pancreatitis:** if severe abdominal pain with or without vomiting occurs, seek medical attention immediately

### Evaluation

**Positive therapeutic outcome**

• Decreased polyuria, polydipsia, polyphagia; improved Hgb A1C

## DULoxetine (Rx)

(du-lox′uh-teen)
**Cymbalta**
*Func. class.:* Antidepressant, miscellaneous
*Chem. class:* Serotonin, norepinephrine reuptake inhibitor (SNRI)

**Do not confuse:** Cymbalta/Symbyax, DULoxetine/FLUoxetine

**ACTION:** Unknown, may potentiate serotoninergic, noradrenergic activity in the CNS. In studies DULoxetine is a potent inhibitor of neuronal serotonin and norepinephrine reuptake

**Therapeutic outcome:** Decreased depression, decreased neuropathic pain

**USES:** Major depressive disorder (MDD), neuropathic pain associated with diabetic neuropathy, generalized anxiety disorder, fibromyalgia, chronic low back pain, osteoarthritis pain

## CONTRAINDICATIONS:

Hypersensitivity, closed-angle glaucoma, alcohol intoxication, alcoholism, hepatic disease, hepatitis, jaundice

**Precautions:** Pregnancy, breastfeeding, geriatric, mania, hypertension, cardiac/renal/hepatic disease, seizures, increased intraocular pressure, anorexia nervosa, bleeding, dehydration, diabetes, hyponatremia, hypotension, hypovolemia, orthostatic hypotension, abrupt drug withdrawal

**BLACK BOX WARNING:** Children, suicidal ideation

## DOSAGE AND ROUTES NTI

### Depression

**Adult:** PO 40-60 mg/day as a single dose or 2 divided doses

### Diabetic neuropathy

**Adult:** PO 60 mg qday

### Generalized anxiety disorder

**Adult:** PO 60 mg/day, may start with 30 mg/day × 1 wk, then increase to 60 mg/day, maintenance 60-120 mg/day

### Fibromyalgia

**Adult:** PO 30 mg/day × 1 wk, then 60 mg/day

### Musculoskeletal pain

**Adult:** PO 60 mg/day or 30 mg/day × 1 wk, then 60 mg/day

### Renal dose

**Adult:** PO Start with 20 mg, gradually increase; avoid use in severe renal disease

**Available forms:** Caps 20, 30, 60 mg

### Implementation

- Swallow caps whole; do not break, crush, or chew; do not sprinkle on food or mix with liquid
- Give without regard to food
- Store in tight container at room temperature; do not freeze
- Provide assistance with ambulation during beginning therapy, since drowsiness, dizziness occur
- Check to see if PO medication was swallowed

## ADVERSE EFFECTS

**CNS:** Insomnia, anxiety, dizziness, tremor, somnolence, fatigue, decreased appetite, decreased weight, agitation, diaphoresis, hallucinations, neuroleptic malignant syndrome–like reaction, aggression, seizures, headache, abnormal dreams, flushing, hot flashes, chills
**CV:** Thrombophlebitis, peripheral edema, palpitations, hypertension, supraventricular dysrhythmia, orthostatic hypotension
**EENT:** *Abnormal vision*
**ENDO:** Hypoglycemia, SIADH
**GI:** Constipation, diarrhea, dysphagia, *nausea,* vomiting, anorexia, dry mouth, colitis, gastritis, abdominal pain, hepatic failure
**GU:** Abnormal ejaculation, urinary hesitation, ejaculation delayed, erectile dysfunction, urinary frequency/retention, gyn bleeding
**INTEG:** Photosensitivity, bruising, sweating, Stevens-Johnson syndrome
**MS:** Gait disturbances, muscle spasm, restless legs syndrome, myalgia
**SYST:** Anaphylaxis, angioedema, serotonin syndrome, Stevens-Johnson syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | 90% protein binding |
| **Metabolism** | Extensively metabolized (CYP2D6, CYP1A2) in the liver to an active metabolite |
| **Excretion** | 70% of product recovered in urine, 20% in feces |
| **Half-life** | 12 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Alcohol: increased ALT, bilirubin

### Drug classifications

- **MAOIs:** coadministration (or within 14 days of MAOIs use) is contraindicated: hyperthermia, rigidity, rapid fluctuations of VS, mental status changes, neuroleptic malignant syndrome

Anticoagulants, antiplatelets, salicylates, NSAIDs: increased bleeding risk
Opioids, antihistamines, sedative/hypnotics: increased CNS depression
CYP1A2 inhibitors (fluvoxaMINE, quinolone antiinfectives); CYP2D6 inhibitors (FLUoxetine, quiNIDine, PARoxetine): increased action of DULoxetine
CYP2D6 extensively metabolized products (flecainide, phenothiazines, propafenone, tricyclics, thioridazine): narrow therapeutic index
SSRIs serotonin receptor agonists: increased serotonin syndrome, neuroleptic malignant syndrome

### Drug/herb

Kava: increased CNS depression
St. John's wort: Increase: serotonin syndrome

### Drug/lab test
Increased: blood glucose

## NURSING CONSIDERATIONS
### Assessment

**BLACK BOX WARNING: Depression:** Assess mental status: mood, sensorium, affect, **suicidal tendencies,** increase in psychiatric symptoms; depression, panic; monitor children weekly face to face during first 4 wk or dosage change, then every other wk for next 4 wk, then at 12 wk

- **Hypo/hyperglycemia:** Assess for each during treatment and before dosing
- Assess B/P lying, standing; pulse q4hr; if systolic B/P drops 20 mm Hg, hold product, notify prescriber; take VS q4hr in patients with CV disease
- Monitor hepatic studies: AST, ALT, bilirubin
- Monitor weight qwk; weight loss or gain; appetite may increase; peripheral edema may occur
- Offer sugarless gum, hard candy, frequent sips of water for dry mouth
- Assess for withdrawal symptoms: headache, nausea, vomiting, muscle pain, weakness; not usual unless product is discontinued abruptly
- Assess for neuroleptic malignant syndrome–like reaction
- **Serotonin syndrome:** assess for nausea, vomiting, dizziness, facial flushing, shivering, sweating
- **Sexual dysfunction:** ejaculation dysfunction, erectile dysfunction, decreased libido, orgasm dysfunction
- **Beers:** Use with caution in older adults, may exacerbate or cause SIADH
- **Pregnancy/breastfeeding:** No well-controlled studies, use only if benefits outweigh fetal risk, complications in late third trimester have occurred, pregnancy should be registered with the Cymbalta **Pregnancy Registry 866-814-6975**

### Patient/family education
- Advise that product is dispensed in small amounts because of suicide potential, especially in the beginning of therapy
- Teach patient/family to use caution when driving or other activities requiring alertness because of drowsiness, dizziness, blurred vision
- Advise patient to avoid alcohol ingestion, other CNS depressants, MAOIs
- Teach patient to notify prescriber of nausea, vomiting, dizziness, facial flushing, shivering, sweating, confusion, hallucinations, incoordination; may indicate serotonin syndrome
- **Abrupt discontinuation:** Advise patient not to discontinue medication quickly after long-term use; may cause nausea, headache, malaise
- Advise patient to wear sunscreen or large hat, since photosensitivity may occur
- Advise patient to notify prescriber if pregnancy is planned or suspected or if breastfeeding
- Tell patient that improvement may occur in 4-8 wk; up to 12 wk (geriatric patients)

**BLACK BOX WARNING:** Advise that clinical worsening and suicide risk may occur

### Evaluation
**Positive therapeutic outcome**
- Decreased depression

## dutasteride (Rx)
(doo-tass'ter-ide)
**Avodart**
*Func. class.:* Sex hormone, 5α-reductase inhibitor
*Chem. class.:* Synthetic 4-azasteroid compound

**ACTION:** Inhibits both types 1 and 2 forms of a steroid enzyme that converts testosterone to 5 μ-dihydrotestosterone (DHT), which is responsible for the initial growth of prostatic tissue

**Therapeutic outcome:** Decreased symptoms of benign prostatic hyperplasia (BPH)

**USES:** Treatment of symptomatic BPH in men with an enlarged prostate gland, or may be used in combination with tamsulosis

**Unlabeled uses:** Alopecia

## CONTRAINDICATIONS
Pregnancy, breastfeeding, children, women, hypersensitivity

**Precautions:** Hepatic disease

## DOSAGE AND ROUTES
### Benign prostatic hyperplasia (BPH)
**Adult:** PO 0.5 mg/day

### Alopecia (unlabeled)
**Adult:** PO 0.5-2.5 mg/day

**Available forms:** Caps 0.5 mg

### Implementation
- Swallow caps whole: do not break, crush, chew, or open
- May be given without regard to meals

## ADVERSE EFFECTS

**GU:** Decreased libido, impotence, gynecomastia, ejaculation disorders (rare), mastalgia, teratogenesis
**INTEG:** Serious skin infections

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Absolute bioavailability ~60% |
| **Distribution** | Protein binding 99% |
| **Metabolism** | Liver (CYP3A4) |
| **Excretion** | Feces |
| **Half-life** | 5 wk at steady state |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | 2-3 hr |
| **Duration** | Levels detectable 4-6 mo post-treatment |

## INTERACTIONS

### Individual drugs

Cimetidine, ciprofloxacin, dilTIAZem, ketoconazole, ritonavir, verapamil: increased dutasteride concentrations

### Drug classifications

Antiretroviral protease inhibitors or other CYP3A4-metabolized products: increased dutasteride concentrations

### Drug/lab test

Decreased: PSA

## NURSING CONSIDERATIONS

### Assessment

- **Assess for decreasing symptoms in BPH:** decreasing urinary retention, frequency, urgency, nocturia
- Assess PSA levels, digital rectal exam, urinary obstruction; determine the absence of urinary cancer before starting treatment
- **Assess liver function tests:** ALT, AST, bilirubin; blood studies: CBC with differential, serum creatinine, serum electrolytes

### Patient/family education

- Advise patient to notify prescriber if therapeutic response decreases, if edema occurs
- Caution patient not to discontinue product abruptly
- Inform patient about changes in sex characteristics, gynecomastia, breast tenderness, decreased libido after 6 mo
- Caution patient not to donate blood for at least 6 mo after last dose to prevent possible blood administration to pregnant woman
- **Pregnancy/breastfeeding:** Advise patient and family that caps should not be handled by pregnant women or those who may become pregnant since this product can be absorbed through the skin
- Inform patient that ejaculate volume may decrease during treatment, that product rarely interferes with sexual function
- Advise patient to read patient information leaflet before starting therapy and reread it upon prescription renewal
- Teach patient product should not be used or handled by breastfeeding women
- Advise patient to swallow whole; do not crush, chew, or open caps
- Teach patient that drug may increase risk for developing high-grade prostate cancer

### Evaluation

#### Positive therapeutic outcome

- Decreased levels of DHT (5 α-dihydrotestosterone)
- Decreased urinary frequency
- Decreased urinary retention
- Decreased urinary urgency
- Decreased nocturia

dabigatran (Rx)
daclatasvir
dalfampridine (Rx)
dapagliflozin
darifenacin
delavirdine (Rx)
desmopressin (Rx)
desoxyribonuclease
dexamethasone sodium phosphate (Rx)
dextromethorphan (OTC)
diclofenac ophthalmic
diclofenac potassium (Rx)
didanosine (Rx)
dihydroergotamine
dinoprostone (Rx)
DOBUTamine (Rx)
docusate calcium (OTC)
dolasetron (Rx)
DOPamine (Rx)
doxazosin (Rx)
DOXOrubicin
dronedarone (Rx)
dutasteride (Rx)

dabrafenib
daclizumab
dalteparin (Rx)
DAPTOmycin (Rx)
DAUNOrubicin (Rx)
denosumab (Rx)
desonide topical
desvenlafaxine (Rx)
dexamethasone ophthalmic

diazePAM (Rx)
diclofenac epolamine (Rx)
diclofenac
difenoxin with atropine
dilTIAZem (Rx)
diphenhydrAMINE (OTC, Rx)
DOCEtaxel (Rx)
docusate sodium (OTC)
dolutegravir
doripenem (Rx)
doxepin (Rx)
DOXOrubicin liposomal
dulaglutide (Rx)

dacarbazine (Rx)
dalbavancin
dantrolene (Rx)
darbepoetin (Rx)
DAUNOrubicin citrate liposome (Rx)
desipramine (Rx)
desoximetasone topical
dexamethasone (Rx)
dexlansoprazole (Rx)

dibucaine topical
diclofenac potassium (Rx)
dicyclomine
digoxin (Rx) NTI
dimenhyDRINATE (OTC, Rx)
divalproex sodium
docosanol topical
dofetilide
donepezil (Rx)
dorzolamide ophthalmic
doxercalciferol
doxycycline (Rx)
DULoxetine (Rx)

## econazole topical

*See Appendix B*

## efavirenz (Rx)

(ef-ah-veer′enz)
**Sustiva**
*Func. class.:* Antiretroviral
*Chem. class.:* Nonnucleoside reverse transcriptase inhibitor (NNRTI)

**ACTION:** Binds directly to reverse transcriptase and blocks RNA polymerase and DNA polymerase, causing a disruption of the enzyme's site

**Therapeutic outcome:** Improvement of HIV-1 infection

**USES:** HIV-1 in combination with other antiretrovirals

### CONTRAINDICATIONS

Pregnancy, hypersensitivity, moderate/severe hepatic disease

**Precautions:** Liver disease, breastfeeding, children <3 yr, renal disease, myelosuppression, depression, seizures

### DOSAGE AND ROUTES

Given in combination with protease inhibitor or nucleoside analog reverse transcriptase inhibitors (NRTIs)
**Adult and child >40 kg:** PO 600 mg/day at bedtime
**Child ≥3 mo:**
7-14.9 kg: PO 200 mg/day at bedtime
15-19.9 kg: PO 250 mg/day at bedtime
20-24.9 kg: PO 300 mg/day at bedtime
25-32.4 kg: PO 350 mg/day at bedtime
32.5-39.9 kg: PO 400 mg/day at bedtime
**Child ≥3 mo, 5-<7.5 kg:** PO 150 mg/day at bedtime
**Child 3.5 ≤5 kg:** PO 100 mg/day at bedtime

**Available forms:** Caps 50, 100, 200 mg; tabs 600 mg

#### Implementation

• Give at bedtime to decrease CNS side effects, give on empty stomach, or sprinkled on food, do not cut/break caps

### ADVERSE EFFECTS

**CNS:** Headache, dizziness, fatigue, impaired cognition, insomnia, abnormal dreams, depression, anxiety, drowsiness, odd feeling, depersonalization
**GI:** *Diarrhea,* abdominal pain, *nausea,* hyperlipidemia, constipation, increased liver function tests, vomiting, hepatotoxicity
**GU:** Hematuria, kidney stones
**INTEG:** *Rash,* erythema multiforme, Stevens-Johnson syndrome, toxic epidermal necrolysis, exfoliative dermatitis

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed, ☙ concentrations higher in females, Africans, Asians, Hispanics |
| **Distribution** | Highly protein bound (99%) |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, feces |
| **Half-life** | Terminal 40-76 hr |

#### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 3-5 hr |
| **Duration** | Unknown |

### INTERACTIONS

#### Individual drugs

Alcohol: increased CNS depression
Amprenavir, indinavir, itraconazole, ketoconazole, lopinavir, posaconazole, saquinavir, voriconazole, cycloSPORINE, tacrolimus, sirolimus, buPROPion, sertraline: decreased level of each specific product
CarBAMazepine: decreased efavirenz levels
Cisapride, midazolam, triazolam, pimozide: do not give together
Ritonavir: increased levels of both products

#### Drug classifications

Anticonvulsants, ergots, statins (except pravastatin, fluvastatin): increased levels of each specific product
Antidepressants, antihistamines, opioids: increased CNS depression
Benzodiazepines, ergots: do not give together
CYP3A4 inhibitors (conivaptan, ambrisentan, sorafenib): decreased efavirenz metabolism
CYP2B6 inhibitors, CYP2C19 substrates, CYP3A4 substrates: Decreased metabolism
CYP3A4 inducers (carBAMazepine, rifamycins): decreased efavirenz effect
Estrogens: increased level of both products
Oral contraceptives: decreased level of these products
Rifamycins: decreased efavirenz action

#### Drug/herb

St. John's wort: decreased efavirenz level; do not use together

#### Drug/food

Increased: absorption of high-fat foods

#### Drug/lab test

Increased: ALT
False positive: cannabinoids

## NURSING CONSIDERATIONS

### Assessment

- **Pregnancy:** Rule out pregnancy before starting treatment; a type of contraception is needed, oral/non-oral contraceptives are decreased, use barrier methods also
- **HIV:** Assess CBC, with differential, plasma HIV RNA, absolute $CD4^+$/$CD8^+$/cell counts/%, serum $\beta_2$ microglobulin, serum ICD+24 antigen levels, cholesterol, hepatic enzymes, blood glucose, pregnancy test, bilirubin, urinalysis
- **Serious skin reactions:** Stevens-Johnson syndrome, toxic epidermal necrolysis, usually occurs during first 2 wk, mild rash may resolve within 30 days; severe skin reactions including blistering, fever, product should be discontinued immediately and corticosteroids started
- Assess bowel pattern before, during treatment; if severe abdominal pain with bleeding occurs, product should be discontinued; monitor hydration
- **Assess for signs of toxicity:** severe nausea/vomiting, maculopapular rash
- **Hepatotoxicity:** Monitor LFTs in those with liver disease, hold if LFTs are moderately elevated; if severe or if LFTs increase after product is restarted, discontinue permanently

### Patient/family education

- Advise patient to take as prescribed; if dose is missed, take as soon as remembered; do not double dose; take on empty stomach with water/juice, teach patient to take at same time of day, not to break tabs, to use with other antiretrovirals
- Instruct patient to make sure health care provider knows of all the medications being taken, supplements, herbs, OTC products
- Advise patient that if severe rash occurs, stop taking and notify health care provider
- Advise patient not to breastfeed or become pregnant if taking this product, use barrier method for ≥ 3 months after last dose
- Avoid use of this product during the first trimester (particular caution during first 8 weeks of pregnancy) and in females of child-bearing potential), consider another product. Register pregnant women with the Antiretroviral Pregnancy Registry at 800-258-4263. Obtain pregnancy testing and confirm the patient is not pregnant before starting treatment. Use after the second trimester of pregnancy can be considered if other alternatives are not available and if adequate contraception can be assured postpartum. Barrier contraception should always be used. If a woman becomes pregnant while taking this drug and the fetus is thus exposed during the first trimester, thoroughly counsel the woman regarding the potential harm to the fetus. To reduce the risk of postnatal transmission, HIV-infected mothers are advised to avoid breastfeeding. This recommendation applies to both untreated women and women who are receiving antiretroviral therapy. This product has been shown to pass into human breast milk.
- Advise patient that adverse reactions (rash, dizziness, abnormal dreams, insomnia) lessen after a month
- Teach patient to avoid hazardous activities if dizziness, drowsiness occurs
- Teach patient that product does not cure disease but controls symptoms; HIV can be transmitted to others even while taking this product
- Advise patient to continue safer-sex practices, that opportunistic infections can occur
- Teach patient to report all adverse reactions, insomnia, poor concentration, but usually are less in 2-4 wk
- Tell patient that CNS side effects of feeling "drunk" or "stoned" usually abate in several months

### Evaluation

**Positive therapeutic outcome**

- Increased CD4, cell counts
- Decreased viral load
- Improvement in symptoms and progression of HIV-1 infection

## efinaconazole topical

*See Appendix B*

## eletriptan (Rx)

(el-ee-trip'tan)

**Relpax**

*Func. class.:* Antimigraine agent

**ACTION:** Binds selectively to the vascular 5-$HT_1$-receptor subtype, exerts antimigraine effect; causes vasoconstriction in cranial arteries

**Therapeutic outcome:** Decreased severity of migraine

**USES:** Acute treatment of migraine with or without aura

## CONTRAINDICATIONS

Uncontrolled hypertension, hypersensitivity, basilar or hemiplegic migraine, ischemic bowel disease, severe renal/hepatic disease, coronary artery vasospasm, peripheral vascular disease, heart disease, acute MI, stroke, angina, postmenopausal women, men >40 yr, risk factors of CAD, MI, or other cardiac disease, hypercholesterolemia, obesity, diabetes

**Precautions:** Pregnancy, breastfeeding, children, geriatric, impaired renal/hepatic function

## DOSAGE AND ROUTES

**Adult: PO** 20 or 40 mg, may increase if needed, max 40 mg (single dose); may repeat in 2 hr if headache improves but returns, max 80 mg/24 hr

**Available forms:** Tabs 20, 40 mg

### Implementation

- Swallow tabs whole; do not break, crush, or chew, take with 8 oz of water, without regard to food
- Provide quiet, calm environment with decreased stimulation from noise, bright light, excessive talking

## ADVERSE EFFECTS

**CNS:** *Dizziness,* headache, anxiety, paresthesia, asthenia, somnolence, flushing, fatigue, hot/cold sensation, chills, vertigo, hypertonia, seizures, serotonin syndrome
**CV:** Chest pain, palpitations, hypertension, MI, sinus tachycardia, stroke, ventricular fibrillation/tachycardia, atrial fibrillation, AV block, bradycardia, chest pressure syndrome, coronary vasospasm
**GI:** Nausea, dry mouth, vomiting
**MS:** *Weakness,* back pain
**RESP:** Chest tightness, pressure

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Urine, feces |
| **Half-life** | 4 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Of pain relief 1/2, peak 1 1/2-2 hr |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Clarithromycin, erythromycin, itraconazole, ketoconazole, nelfinavir, propanolol, ritonavir: increased eletriptan effect

### Drug classifications

CYP3A4 inhibitors: increased concentration of ergots, eletriptan, avoid use within 72 hr of these products
SSRIs, SNRIs, serotonin-receptor agonists, linezolid, MAOIs: increased serotonin syndrome
Ergots, ergot similar products: Increase: vasospastic reactions, avoid use within 24 hr of these products

## NURSING CONSIDERATIONS

### Assessment

- **Migraine:** pain location, character, intensity, nausea, vomiting, aura
- Monitor B/P; signs/symptoms of coronary vasospasms; geriatrics may be at higher risk
- Assess for tingling, hot sensation, burning, feeling of pressure, numbness, flushing
- Assess stress level, activity, recreation, coping mechanisms
- Assess neurologic status: LOC, blurring vision, nausea, vomiting, tingling in extremities preceding headache
- Identify ingestion of tyramine foods (pickled products, beer, wine, aged cheese), food additives, preservatives, colorings, artificial sweeteners, chocolate, caffeine, which may precipitate these types of headaches
- Determine if CYP3A4 inhibitors or other ergot type products have been given
- There have been no adequate and well-controlled studies in pregnant women; therefore the use of this product during pregnancy is not recommended unless the benefits outweigh the risks. Product is excreted into human breast milk, and caution is advisable when administering the drug during breastfeeding.

### Patient/family education

- Teach patient to avoid driving or hazardous activity if dizziness occurs
- Teach patient to report chest pain, neck or jaw pain
- Teach patient to take with whole glass of water
- Teach patient to use contraception while taking product
- Teach patient to have dark, quiet environment
- Teach patient that product does not prevent or reduce number of migraine attacks
- Teach patient to take when migraine is starting, a second dose may be used if headache returns

### Evaluation

**Positive therapeutic outcome**

- Decreased severity of migraine

## eltrombopag

**Promacta**

*See Appendix A, Selected New Drugs*

**Do not confuse:** elvitegravir/cobicistat/emtricitabine/tenofovir/clostuzumab

## emedastine ophthalmic

*See Appendix B*

## empagliflozin

(em-pa-gli-floe′zin)
**Jardiance**
*Func. class.:* Antidiabetic
*Chem. class.:* Sodium-glucose cotransporter 2 (SGLT2) inhibitors

**ACTION:** An inhibitor of sodium-glucose cotransporter 2 (SGLT2), the transporter responsible for reabsorbing the majority of glucose filtered by the tubular lumen in the kidney

**Therapeutic outcome:** Decreased blood glucose, A1c

**USES:** Type 2 diabetes mellitus with diet and exercise

**CONTRAINDICATIONS:** Hypersensitivity, dialysis, renal failure

**Precautions:** Adrenal insufficiency, breastfeeding, children, dehydration, diabetic ketoacidosis, fever, geriatric patients, hypercholesterolemia, hypercortisolism, hyperglycemia, hyperthyroidism, hypoglycemia, hypotension, hypothyroidism, hypovolemia, malnutrition, pituitary insufficiency, pregnancy, renal impairment, type 1 diabetes mellitus, vaginitis

### DOSAGE AND ROUTES

**Adult: PO** 10 mg daily, may increase to 25 mg daily

**Available forms:** Tabs 10, 25 mg

#### Implementation

- Give every day without regard to food in the AM

### ADVERSE EFFECTS

**CNS:** Syncope
**CV:** Hypotension, orthostatic hypotension
**ENDO:** Hypercholesterolemia, hyperlipidemia, hypoglycemia
**GU:** Increased urinary frequency, nocturia, polyuria, cystitis, dehydration, diuresis
**GI:** Nausea
**MISC:** Infection
**MS:** Arthralgia

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 82.6% |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Terminal elimination half-life 12.4 hr |

#### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1.5 hr |
| **Duration** | Unknown |

### INTERACTIONS

#### Individual drugs

Alcohol, bortezomib, cloNIDine, lithium: increased/decreased hypoglycemic effect
Baclofen, cycloSPORINE, dexfenfluramine, dextrothyroxine, ethotoin, fenfluramine, fosphenytoin, glucagon, phenytoin, tacrolimus, tobacco: decreased hypoglycemic effect
FLUoxetine, octreotide, OLANZapine: increased hypoglycemic effect
Gatifloxacin: do not use concurrently

#### Drug classifications

Androgens, sulfonamides: increase/decreased hypoglycemic effect
Angiotensin II receptor antagonists, angiotensin-converting enzyme (ACE) inhibitors, β-blockers, fibric acid derivatives, loop diuretics, MAOIs type A, thiazide diuretics: increased hypoglycemic effect
Atypical antipsychotics, carbonic anhydrase inhibitors, corticosteroids, estrogens, oral contraceptives, phenothiazines, progestins, salicylates: decreased hypoglycemic effect
Thyroid hormones: do not use concurrently

#### Drug/herb

Chromium, horse chestnut: increased hypoglycemia
Green tea: decreased hypoglycemia
Niacin: increased/decreased hypoglycemia

#### Drug/lab test

**Hct, creatinine:** Increase
**GFR:** Increase

### NURSING CONSIDERATIONS

#### Assessment

- **Diabetes:** Monitor blood glucose, glycosylated hemoglobin A1c (HbA1c), serum cholesterol profile, serum creatinine/BUN, assess for polydipsia, other products taken by patient
- **Fractures:** Assess fracture risk before use, do not use in patients with risk of fractures
- **Pregnancy/breastfeeding:** Use if benefits outweigh risk to fetus, no well-controlled studies, do not breastfeed

#### Patient/family education

- Teach patient how to check blood glucose, to continue with diet and exercise changes, to avoid smoking, alcohol
- Instruct patient to avoid other products unless approved by prescriber

• To take in the am, without regard to food; if dose is missed, take when remembered; do not take double dose, to read "medication guide" provided, that product controls symptoms but does not cure diabetes
• To follow medical regimen, including diet, exercise, and weight loss
• To teach how to take blood glucose, urine ketones readings, and how often
• **Pregnancy/breastfeeding:** To report if pregnancy is planned or suspected, to avoid breastfeeding
• **Hypoglycemia:** To report rapid heartbeat, dizziness, weakness, that lab testing will be needed including blood glucose monitoring, a dosage change may be needed, to carry a sugar source at all times, review signs and symptoms of hypoglycemia and hyperglycemia and what to do about each
• **Hypotension:** To report vision changes, dizziness, fatigue, B/P should be checked regularly
• **Ketoacidosis:** To report nausea, vomiting, abdominal pain, confusion, sleepiness
• **Infections:** Usually urinary tract infections, patient should report burning, cloudy, foul-smelling urine; fever; back pain, antibiotics will be needed, or mycotic infections including foul-smelling vaginal discharge or penis discharge and redness

### Evaluation

**Positive therapeutic outcome**
• Decreased blood glucose, A1c

## emtricitabine (Rx)

(em-tri-sit'uh-bean)
**Emtriva**
*Func. class.:* Antiretroviral
*Chem. class.:* Nucleoside reverse transcriptase inhibitor (NRTI)

**ACTION:** Synthetic nucleoside analog of cytosine; inhibits replication of HIV virus by competing with the natural substrate and then becoming incorporated into cellular DNA by viral reverse transcriptase, thereby terminating cellular DNA chain

**Therapeutic outcome:** Decreasing symptoms of HIV

**USES:** HIV-1 infection with other antiretrovirals

**Unlabeled uses:** HBV (hepatitis B virus) infection

## CONTRAINDICATIONS

Hypersensitivity, lactic acidosis

**Precautions:** Pregnancy, breastfeeding, children, geriatric, renal disease

**BLACK BOX WARNING:** Hepatic insufficiency, chronic hepatitis B virus (HBV) infection, more common in females or those that are overweight; monitor lactic acid levels, LFTs

## DOSAGE AND ROUTES

**Oral cap and sol are not interchangeable**

**Adult:** PO (caps) 200 mg/day; oral SOL 240 mg (24 ml) daily
**Adolescent/child >33 kg:** PO (caps) 200 mg/day
**Child 3 mo-17 yr:** oral SOL 6 mg/kg/day, max 240 mg (24 ml)
**Infant <3 mo:** PO oral SOL 3 mg/kg daily, do not use caps

### Renal dose

**Adult:** PO CCr 30-49 ml/min 200 mg q48hr, SOL 120 mg q24hr; caps CCr 15-29 ml/min 200 mg q72hr, SOL 80 mg q24hr; caps CCr ,15 ml/min 200 mg q96hr, SOL 60 mg q24hr

**Available forms:** Caps 200 mg; oral sol 10 mg/ml; oral cap and sol are not interchangeable

### Implementation

• Give without regard to meals
• Store at 25° C (77° F)
• Take at same time every day
• Oral cap and sol are not interchangeable

## ADVERSE EFFECTS

**CNS:** Headache, abnormal dreams, depression, dizziness, insomnia, neuropathy, paresthesia, *asthenia*
**GI:** *Nausea, vomiting, diarrhea, anorexia, abdominal pain, dyspepsia,* hepatomegaly with stenosis (may be fatal)
**INTEG:** Rash, skin discoloration
**MS:** Arthralgia, myalgia
**RESP:** Cough
**SYST:** Change in body fat distribution, lactic acidosis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly, extensively absorbed |
| **Distribution** | Protein binding <4% |
| **Metabolism** | Unknown |
| **Excretion** | Excreted unchanged in urine (86%), feces (14%) |
| **Half-life** | 10 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-2 hr |
| **Duration** | Unknown |

## INTERACTIONS

Ribavirin: Complex interactions

### Drug classifications

**Interferons:** Decreased emtricitabine level

### Drug/Lab

Increase: AST/ALT, glucose, amylase, bilirubin, CK, lipase
Decrease: neutrophils

## NURSING CONSIDERATIONS

### Assessment

- **HIV:** Monitor for infections and improvement in symptoms of HIV
- Monitor liver, renal function tests: AST, ALT, bilirubin, amylase, lipase, triglycerides periodically during treatment
- Use if clearly needed, register pregnant woman at the Antiretroviral Pregnancy Registry at 800-258-4263. To reduce the risk of postnatal transmission, HIV-infected mothers are advised to avoid breastfeeding
- **Assess for lactic acidosis, severe hepatomegaly with steatosis;** if lab reports confirm these conditions, discontinue treatment; more common in females, obese; monitor serum lactate levels, liver function tests

**BLACK BOX WARNING:** Confirm that patient is free of HBV (hepatitis B virus) before starting treatment

**BLACK BOX WARNING: Hepatotoxicity:** Do not use in those with risk factors such as alcoholism; discontinue if hepatotoxicity occurs

- **Hepatitis B and HIV coinfection (unlabeled):** Perform HBV screening in any patient who has HIV to ensure appropriate treatment; avoid single-drug treatments in HBV

### Patient/family education

- Teach that GI complaints resolve after 3-4 wk of treatment
- Advise patient to report planned or suspected pregnancy, not to breastfeed while taking this product
- Instruct that product must be taken at same time of day to maintain blood level, solution and cap are not interchangeable
- Advise that product will control symptoms, but is not a cure for HIV; patient is still infectious, may pass HIV virus on to others
- Instruct that other products may be necessary to prevent other infections
- Advise that changes in body fat distribution may occur
- **Lactic acidosis:** Teach patient to notify prescriber immediately of fatigue, muscle aches/pains, abdominal pain, difficulty breathing, nausea, vomiting, change in heart rate

**BLACK BOX WARNING:** Hepatotoxicity: Teach patient to notify prescriber of dark urine, yellowing of skin/eyes, clay-colored stools, anorexia, nausea, vomiting

- Instruct patient to avoid breastfeeeding to reduce postnatal HIV transmission

### Evaluation

**Positive therapeutic outcome**

- Decrease in signs/symptoms of HIV
- Decrease viral load, increase CD4 counts

## emtricitabine/rilpivirine/tenofovir

(em-tri-situh-bean/ril-pi-vireen/ten-oh-fohveer)

**Complera**

*Func. class.:* Antiretroviral
*Chem. class.:* Nucleoside reverse transcriptase inhibitor (NRTI)

## ACTION:

- Emtricitabine: Inhibits viral reverse transcriptase and is active both on HIV-1 and HBV
- Tenofovir: Inhibits viral reverse transcriptase and acts as a DNA chain terminator
- Rilpivirine: Inhibits HIV-1 reverse transcriptase; it does not compete for binding, nor does it require phosphorylation to be active

**Therapeutic outcome:** Improvement in CD4, HIV RNC counts, decreasing signs and symptoms of HIV

**USES:** HIV in treatment-naive patients with HIV RNA ≤100,000 copies/ml at initiation and certain virologically stable (HIV RNA >50 copies/ml) treatment-experienced patients

## CONTRAINDICATIONS

Hypersensitivity

**PRECAUTIONS:** Alcoholism, autoimmune disease, bone fractures, breastfeeding, children, depression, females, Graves' disease, Guillain-Barré syndrome, hepatic disease, hepatitis, hepatitis B and HIV coinfection, hepatitis C and HIV coinfection, hepatomegaly, HIV resistance, hypercholesterolemia, hyperlipidemia, hypertriglyceridemia, hypophosphatemia, immune reconstitution syndrome, obesity, osteomalacia, osteoporosis, pregnancy, QT prolongation, renal failure, renal impairment, serious rash, suicidal ideation, torsades de pointes

**BLACK BOX WARNING:** Hepatitis B exacerbation, hepatotoxicity, lactic acidosis

## DOSAGE AND ROUTES

Treatment of HIV infection in antiretroviral treatmentnaive patients with HIV RNA concentrations 100,000 copies/ml or less at treatment initiation and certain virologically stable (HIV RNA <50 copies/ml) treatment-experienced patients

**Adult/adolescent/child 12 years and older weighing 35 kg or more:** PO 1 tablet (200 mg emtricitabine; 25 mg rilpivirine; 300 mg tenofovir) qday. During coadministration with rifabutin, the rilpivirine dose needs to be increased to 50 mg qday; give an additional 25 mg/day of rilpivirine with a meal

### HIV prophylaxis after occupational exposure to HIV (unlabeled)

**Adult: PO** 1 tablet (200 mg emtricitabine; 25 mg rilpivirine; 300 mg tenofovir disoproxil fumarate) qday × 28 days

### Renal dose

**Adult:** PO CCr <50 ml/min: Not recommended

**Available forms:** Tablet 200-25-300 mg

### Implementation:

- Antiretroviral drug resistance testing (preferably genotypic testing) is recommended before use in treatment-naive patients and before changing therapy for treatment failure
- For adults, treatment is recommended in all patients to reduce the risk of disease progression and to prevent the transmission of HIV, including perinatal transmission and transmission to sexual partners. Conditions increasing the urgency for therapy include pregnancy, AIDS-defining conditions (including HIV-associated dementia), acute or early HIV infection, acute opportunistic infections, HIV-associated nephropathy, hepatitis B (HBV) or hepatitis C (HCV) coinfection, lower CD4 counts (<200 cells/mm$^3$), rapidly declining CD4 counts (>100 cells/mm$^3$ decrease per year), or higher viral loads (>100,000 copies/ml)
- For pregnant women, therapy should begin immediately after HIV diagnosis, as early maternal viral suppression is associated with lower risk of perinatal infection
- Before initiating therapy consider the following: virologic failures occurred more frequently in those with baseline HIV RNA concentrations >100,000 copies; CD4 counts <200 cells/mm$^3$
- Avoid use of tenofovir-containing regimens in those with renal disease and osteoporosis

## ADVERSE EFFECTS

**CNS:** *Headache,* abnormal dreams, *depression,* dizziness, *insomnia,* neuropathy, paresthesia, asthenia, suicide, fatigue, drowsiness
**GI:** *Nausea, vomiting, anorexia, diarrhea, abdominal pain, dyspepsia,* hepatomegaly with stenosis (may be fatal), hyperbilirubinemia, hypercholesterolemia, pancreatitis
**GU:** Glomerulonephritis membranous/mesangial proliferative
**Integ:** *Rash,* skin discoloration
**MS:** Arthralgia, myalgia, rhabdomyolysis
**Resp:** *Cough*
**Syst:** Change in body fat distribution, lactic acidosis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Tenofovir: bioavailability is increased with a high-fat meal |
| **Distribution** | Rilpivirine: Protein binding 99.7% to albumin; tenofovir <0.7% ; emtricitabine <4% |
| **Metabolism** | **Emtricitabine:** metabolized via oxidation to 3'-sulfoxide diastereomer (approximately 9% of dose) and via conjugation with glucuronic acid to 2'-O-glucuronide (approximately 4% of dose); **Tenofovir:** undergoes phosphorylation to its active metabolite; **Rilpivirine:** Via oxidation by CYP3A system |
| **Excretion** | Emtricitabine: excreted renally (86%) and via feces (14%); tenofovir: eliminated by a combination of glomerular filtration and active renal tubular secretion, 70%-80% excreted unchanged in urine by 72 hr; **rilpivirine:** 85% feces, 6.1% urine |
| **Half-life** | **Emtricitabine:** half-life 10 hr: **Tenofovir:** terminal elimination half-life 17 hr; **Rilpivirine:** terminal elimination half-life 50 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Emtricitabine: Peak 1-2 hr postdose; Rilpivirine: Peak 4-5 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Arsenic trioxide, chloroquine, droperidol, haloperidol, levomethadyl, pentamidine: increased QT prolongation

Efavirenz, lamivudine: Do not use with, treatment duplication will occur

Fluconazole, voriconazole: increased rilpivirine adverse reactions, fungal infections

### Drug classifications

Arsenic trioxide, beta agonists, class IA/III antidysrhythmics, CYP3A4 inhibitors (amiodarone, clarithromycin, erythromycin, levomethadyl, telithromycin, troleandomycin), CYP3A4 substrates (methadone, pimozide, quetiapine, quinidine, risperidone, ziprasidone), local anesthetics, some phenothiazines, tricyclics: increased QT prolongation

CYP3A4 inducers (barbiturates, bexarotene, bosentan, carbamazepine, dexamethasone, efavirenz, enzalutamide, etravirine, griseofulvin, modafinil, nafcillin, nevirapine, phenobarbital, phenytoin, primidone, rifabutin, rifampin, rifapentine), proton pump inhibitors: decreased rilpivirine effect, treatment failure

CYP3A4 inhibitors (aldesleukin IL-2, amiodarone, aprepitant, atazanavir, basiliximab, boceprevir, bromocriptine, chloramphenicol, clarithromycin, conivaptan, danazol, dalfopristin, darunavir, dasatinib, delavirdine, diltiazem, dronedarone, efavirenz, erythromycin, ethinyl estradiol, fluconazole, fluoxetine, fluvoxamine, fosamprenavir, fosaprepitant, imatinib, indinavir, isoniazid, itraconazole, ketoconazole, lanreotide, lapatinib, miconazole, nefazodone, nelfinavir, nicardipine, octreotide, posaconazole, quinine, ranolazine, rifaximin, tamoxifen, telaprevir, telithromycin, tipranavir, troleandomycin, verapamil, voriconazole, zafirlukast): increased rilpivirine level

Interferons: decreased emtricitabine level

### Drug/food

Increased: Adverse reactions: grapefruit juice

### Drug/lab test

Increased: AST/ALT, amylase, bilirubin, CK, glucose, lipase

Decreased: Neutrophils

## NURSING CONSIDERATIONS

### Assessment

• **HIV infection:** Assess symptoms of HIV, including opportunistic infections, before and during treatment, some may be life threatening; monitor plasma CD4+, CD8 cell counts, serum beta-2 microglobulin, serum ICD+24 antigen levels, treatment failures occur more often in those with baseline HIV-1 RNA concentrations >100,000 copies/ml than in those <100,000 copies/ml; monitor blood glucose, CBC with differential, serum cholesterol, lipid panel

**BLACK BOX WARNING:** Hepatotoxicity/lactic acidosis: Monitor hepatitis B serology, LFTs, plasma hepatitis C RNA, lactic acidosis levels. If lab reports confirm these conditions, discontinue product. More common in females or those who are overweight. Avoid use in alcoholism

• **Pregnancy:** Obtain pregnancy testing before use Hepatitis B exacerbation: Those with coexisting HBV and HIV infections who discontinue emtricitabine or tenofovir may experience severe acute hepatitis B exacerbation with some cases resulting in hepatic decompensation and hepatic failure. Patients coinfected with HBV and HIV who discontinue this product should have transaminase concentrations monitored q6wk for the first 3 mo, and q3-6 mo thereafter. Resumption of anti–hepatitis B treatment may be required. For patients who refuse a fully suppressive antiretroviral regimen but still require treatment for HBV, consider 48 wk of peginterferon alfa; do not administer HIV-active medications in the absence of a fully suppressive ARV regimen

• Periodically monitor serum bilirubin (total and direct), serum creatinine, urinalysis, LFTs, amylase, lipase

### Evaluate

### Teach patient/family:

• That hepatitis and HIV coinfected patients should avoid consuming alcohol; offer vaccinations against hepatitis A/hepatitis B as appropriate

• That GI complaints resolve after 2-3 wk of treatment

• To report suspected or planned pregnancy, not to breastfeed

• To take at the same time of day to maintain blood level, not to crush, break, or chew

• That product controls the symptoms of HIV but does not cure, that patient is still able to infect others, that other products may be necessary to prevent other infections

**BLACK BOX WARNING: Lactic acidosis:** To notify prescriber of fatigue, muscle aches/pains, abdominal pain, difficulty breathing, nausea, vomiting, change in heart rhythm

**BLACK BOX WARNING: Hepatotoxicity:** To notify prescriber of dark urine, yellowing skin or eyes, clay-colored stools, anorexia, nausea, vomiting

- **Suicide:** To report severe depression, suicidal ideation to prescriber immediately

**Evaluation:** Improvement in CD4, HIV RNC counts, decreasing signs and symptoms of HIV

## enalapril/enalaprilat (Rx)

(e-nal'a-pril/e-nal'a-pril-at)

**Vasotec**

*Func. class.:* Antihypertensive

*Chem. class.:* Angiotensin-converting enzyme (ACE) inhibitor

**Do not confuse:** enalapril/Eldepryl/ramipril/Anafranil

**ACTION:** Selectively suppresses renin-angiotensin-aldosterone system; inhibits ACE; prevents conversion of angiotensin I to angiotensin II, resulting in dilatation of arterial and venous vessels

**Therapeutic outcome:** Decreased B/P in hypertension; decreased preload, afterload in HF

**USES:** Hypertension, HF, left ventricular dysfunction

## CONTRAINDICATIONS

Hypersensitivity, history of angioedema

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Breastfeeding, renal disease, hyperkalemia, hepatic failure, dehydration, bilateral renal artery/aortic stenosis

## DOSAGE AND ROUTES

### Hypertension

**Adult:** PO 2.5-5 mg/day, may increase or decrease to desired response, range 10-40 mg/day; **IV** 0.625-1.25 mg q6hr over 5 min

**Child:** PO 0.08 mg/kg/day in 1-2 divided doses, max 0.58 mg/kg/day in 1-2 divided doses; **IV** 5-10 mcg/kg/dose q8-24hr

### HF

**Adult:** PO 2.5-20 mg/day in 2 divided doses, max 40 mg/day in divided doses

### Renal dose

**Adult:** PO CCr <30 ml/min 2.5 mg/day, increase gradually; IV CCr >30 ml/min 1.25 mg q6hr; CCr <30 ml/min 0.625 mg as one-time dose, increase as per B/P

**Available forms:** Enalapril: tabs 2.5, 5, 10, 20 mg; enalaprilat: inj 1.25 mg/ml

### Implementation

**PO route**

- Store in airtight container at 86° F (30° C) or less
- Severe hypotension may occur after 1st dose of this medication; hypotension may be prevented by reducing or discontinuing diuretic therapy 3 days before beginning benazepril therapy
- Give by **IV** inf of 0.9% NaCl (as ordered) to expand fluid volume if severe hypotension occurs

**Direct IV route/ intermittent IV infusion**

- Give undiluted over ≥5 min; use diluent provided or 50 ml $D_5W$, 0.9% NaCl, 0.9% NaCl in $D_5W$, or LR, give over ≥5 min, sol is stable for 24 hr

**Y-site compatibilities:** Acyclovir, alemtuzumab, alfentanil, allopurinol, amifostine, amikacin, aminophylline, amphotericin B liposome, anidulafungin, ascorbic acid, atracurium, atropine, azaTHIOprine, aztreonam, benztropine, bivalirudin, bretylium, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, ceFAZolin, cefonicid, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, cimetidine, cisatracurium, cladribine, clindamycin, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, dextran 40, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doripenem, doxacurium, DOXOrubicin, DOXOrubicin liposome, doxycycline, ePHEDrine, EPINEPHrine, epirubicin, epoetin, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, fluorouracil, folic acid, furosemide, ganciclovir, gemcitabine, gentamicin, granisetron, heparin, hydrocortisone, HYDROmorphone, ifosfamide, imipenem/cilastatin, indomethacin, insulin, isoproterenol, ketorolac, labetalol, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, meropenem, metaraminol, methicillin, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, mezlocillin, miconazole, midazolam, milrinone, minocycline, mitoXANtrone, morphine, moxalactam, multiple vitamin infusion, nafcillin, nalbuphine, naloxone, netilmicin, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, papaverine, PEMEtrexed, penicillin G potassium, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phentolamine, phenylephrine,

phytonadione, piperacillin/tazobactam, potassium chloride/phosphate, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, pyridoxine, quinupristin/dalfopristin, ranitidine, remifentanil, ritodrine, riTUXimab, rocuronium, sodium acetate, sodium bicarbonate, succinylcholine, SUFentanil, tacrolimus, teniposide, tetracycline, theophylline, thiamine, thiotepa, ticarcillin/clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, trastuzumab, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, voriconazole

**Y-site incompatibilities:** Amphotericin B cholesteryl sulfate, caspofungin, cefepime, dantrolene, diazepam, diazoxide, gemtuzumab, lansoprazole, phenytoin

## ADVERSE EFFECTS

**CNS:** *Insomnia, dizziness,* paresthesias, headache, fatigue, anxiety
**CV:** *Hypotension,* chest pain, tachycardia, dysrhythmias, syncope, angina, MI, orthostatic hypotension
**EENT:** *Tinnitus,* visual changes, sore throat, double vision, dry burning eyes
**GI:** Nausea, vomiting, colitis, cramps, diarrhea, constipation, flatulence, dry mouth, loss of taste, hepatotoxicity
**GU:** Proteinuria, renal failure, increased frequency of polyuria or oliguria
**HEMA:** Agranulocytosis, neutropenia
**INTEG:** Rash, purpura, alopecia, hyperhidrosis, photosensitivity
**META:** Hyperkalemia
**RESP:** Dyspnea, dry cough, crackles
**SYST:** Toxic epidermal necrolysis, Stevens-Johnson syndrome, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO), complete (**IV**) |
| **Distribution** | Unknown |
| **Metabolism** | Liver (active metabolite—enalaprilat) |
| **Excretion** | Kidneys (60%—enalaprilat, 20%—enalapril) |
| **Half-life** | Enalaprilat 35 hr, increased in renal disease |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | 1 hr | 5-15 min |
| **Peak** | 4-6 hr | 1-4 hr |
| **Duration** | 24 hr | 4-6 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased hypotension (large amounts)
Allopurinol: increased hypersensitivity
CycloSPORINE, NSAIDs: increased potassium levels
Digoxin, lithium: increased serum levels
Rifampin: decreased effects of enalapril

### Drug classifications

Antacids: decreased effects of enalapril
Diuretics, general anesthesia, nitrates, other antihypertensives, phenothiazines: increased hypotension
Diuretics (potassium-sparing), potassium supplements, salt substitutes: increased potassium levels

### Drug/lab test

Increased: ALT, AST, bilirubin, alkaline phosphatase, glucose, uric acid, BUN, creatinine
False positive: ANA titer

## NURSING CONSIDERATIONS

### Assessment

- **Bone marrow depression (rare):** monitor blood studies: neutrophils, decreased platelets with differential baseline and q3mo; if neutrophils $<1000/mm^3$, discontinue treatment
- **Hypertension:** monitor B/P, orthostatic hypotension, syncope; if changes occur, dosage change may be required; obtain peak/trough levels, maintain adequate hydration

> **BLACK BOX WARNING: Pregnancy:** Identify if pregnancy is planned or suspected or if breastfeeding; in pregnancy, breastfeeding, fetal harm may occur

- **HF:** monitor for increased weight, rales, jugular vein distention, edema, difficulty breathing
- Monitor electrolytes: K, Na, Cl during 1st 2 wk of therapy
- **Monitor renal studies:** protein, BUN, creatinine; increased levels may indicate nephrotic syndrome and renal failure; monitor renal symptoms: polyuria, oliguria, frequency, dysuria
- Establish baselines in renal, liver function tests before therapy begins and 1 wk into therapy, avoid activities requiring coordination, those with impaired renal function should be monitored for hyperkalemia
- Check potassium levels throughout treatment, although hyperkalemia rarely occurs
- Check for edema in feet, legs daily
- **Serious skin disorders, angioedema:** Black patients are more likely to develop angioedema; also, product is less effective;

if rash occurs, stop product and notify prescriber

### Patient/family education

- Advise patient not to discontinue product abruptly; advise patient to tell all persons associated with health care that product is being taken
- Teach patient not to use OTC products (cough, cold, allergy medications) unless directed by physician, to avoid potassium, salt substitutes; serious side effects can occur; xanthines, such as coffee, tea, chocolate, cola, can prevent action of product
- Instruct patient on the importance of complying with dosage schedule, even if feeling better; to continue with medical regimen to decrease B/P: exercise, cessation of smoking, decreasing stress, diet modifications
- Emphasize the need to rise slowly to sitting or standing position to minimize orthostatic hypotension; not to exercise in hot weather, which can cause increased hypotension
- Advise patient to notify prescriber of mouth sores, sore throat, fever, swelling of hands or feet, irregular heartbeat, chest pain, coughing, shortness of breath, trouble breathing
- Caution patient to report excessive perspiration, dehydration, vomiting, diarrhea; may lead to fall in B/P
- Caution patient that product may cause skin rash or impaired perspiration; that angioedema may occur and to discontinue if it occurs
- Caution patient that product may cause dizziness, fainting, light-headedness; may occur during 1st few days of therapy; to avoid activities that may be hazardous
- Teach patient how to take B/P, normal readings for age-group

**BLACK BOX WARNING:** Teach patient to use contraception during treatment, **pregnancy,** to notify prescriber if pregnancy is planned or suspected, not to breastfeed

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P in hypertension

## TREATMENT OF OVERDOSE:

Lavage, **IV** atropine for bradycardia; **IV** theophylline for bronchospasm, digoxin, $O_2$; diuretic for cardiac failure, hemodialysis

## enfuvirtide (Rx)

(en-fyoo′vir-tide)

**Fuzeon**

*Func. class.:* Antiretroviral

*Chem. class.:* Fusion inhibitor

E

## ACTION:

Inhibitor of the fusion of HIV-1 with CD4+ cells

**Therapeutic outcome:** Decreasing symptoms of HIV

## USES:

Treatment of HIV-1 infection in combination with other antiretrovirals in those who are treatment experienced only

## CONTRAINDICATIONS

Breastfeeding, hypersensitivity

**Precautions:** Pregnancy, (must be enrolled in the Antiretroviral Pregnancy Registry: 800-258-4263), children <6 yr, liver disease, myelosuppression, infections

## DOSAGE AND ROUTES

**Adult:** SUBCUT 90 mg (1 ml) bid

**Child 6-16 yr and <42.6 kg:** SUBCUT 2 mg/kg bid, max 90 mg bid; **11-15.5 kg** 27 mg/0.3 ml bid; **15.6-20 kg** 36 ml/0.4 ml bid; **20.1-24.5 kg** 45 mg/0.5 ml bid; **24.6-29 kg** 54 mg/0.6 ml bid; **29.1-33.5** kg 63 mg/0.7 ml bid; **33.6-38 kg** 72 mg/0.8 ml bid; **38.1-42.5 kg** 81 mg/0.9 ml bid

**Available forms:** Powder for inj, lyophilized 108 mg (90 mg/ml when reconstituted)

### Implementation

- Give SUBCUT, bid; rotate sites; preferred sites are upper arm, anterior thigh, abdomen

## ADVERSE EFFECTS

**CNS:** Anxiety, peripheral neuropathy, taste disturbance, Guillain-Barré syndrome, insomnia, depression, fatigue, peripheral neuropathy
**GI:** Nausea, abdominal pain, anorexia, constipation, pancreatitis, dry mouth, weight loss
**GU:** Glomerulonephritis, renal failure
**HEMA:** Thrombocytopenia, neutropenia
**INTEG:** *Inj site reactions, skin papilloma*
**MISC:** Influenza, cough, conjunctivitis, lymphadenopathy, myalgias, hyperglycemia, bacterial hypersensitivity, pneumonia, rhinitis, fatigue

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | 92% protein binding |
| **Metabolism** | Undergoes catabolism |
| **Excretion** | Unknown |
| **Half-life** | Terminal 3.8 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 8 hrs |
| **Duration** | Unknown |

## INTERACTIONS

### Drug/drug

Protease inhibitors: Increase effect of either product

### Drug/lab

Increased: LFTs, lipase, CK triglycerides
Decreased: Hgb

## NURSING CONSIDERATIONS

### Assessment

- Assess for signs of infection, inj site reactions, use analgesics; bacterial pneumonia may occur if blood counts are low or viral load is high or low CD4 counts, IV drug user, lung disease
- **Monitor renal studies:** BUN, creatinine, renal failure may occur
- Monitor bowel pattern before, during treatment; if severe abdominal pain or constipation occurs, notify prescriber; monitor hydration
- Assess skin eruptions, rash, urticaria, itching
- Identify allergies before treatment, reaction to each medication, may occur quickly or later
- CBC, blood chemistry, plasma HIV RNA, absolute CD4/CD8 cell counts/%, serum $\beta_2$ microglobulin, serum ICD+24 antigen levels, cholesterol
- **Immune reconstitution syndrome:** Occurs with combination therapy
- **Peripheral neuropathy:** May occur and last for several months

### Patient/family education

- Instruct to notify prescriber if pregnancy is suspected, avoid breastfeeding, if pregnant register with the antiretroviral pregnancy registry 800-258-4263
- Advise that pneumonia may occur, to contact prescriber if cough, fever occur
- Teach that hypersensitive reactions may occur: rash, pruritus; stop product, contact prescriber
- Teach that this product is not a cure for HIV-1 infection but controls symptoms; HIV-1 can still be transmitted to others
- Teach that this product is to be used in combination only with other antiretrovirals
- Teach patient how to prepare and give using subcut injection, watch for site reactions, rotate sites
- Teach patient that pneumonia may occur; to contact prescriber if cough, fever occur
- **Pregnancy:** Identify if pregnancy is planned or suspected, if breastfeeding; if more information is needed call 877-438-9366

### Evaluation

**Positive therapeutic outcome**

- Increased CD4 cell counts; decreased viral load; slowing progression of HIV-1 infection

**⚠ HIGH ALERT**

## enoxaparin (Rx)

(ee-nox'a-par-in)
**Lovenox**
*Func. class.:* Anticoagulant, antithrombotic
*Chem. class.:* Unfractionated porcine heparin (low-molecular-weight heparin)

**Do not confuse:** enoxaparin/enoxacin, Lovenox/Lotronex

**ACTION:** Binds to antithrombin III inactivating factors Xa/IIa resulting in higher ratio of anti-factor Xa to anti-factor IIa

**Therapeutic outcome:** Prevention of deep vein thrombosis

**USES:** Prevention of DVT (inpatient or outpatient), pulmonary emboli (inpatient) in hip and knee replacement, abdominal surgery at risk for thrombosis; unstable angina/non–Q-wave MI, acute MI, coronary artery thrombosis

## CONTRAINDICATIONS

Hypersensitivity to this product, heparin, or pork; hemophilia; leukemia with bleeding; thrombocytopenic purpura, heparin-induced thrombocytopenia, active major bleeding

**Precautions:** Pregnancy, breastfeeding, children, geriatric, severe renal/hepatic disease, blood dyscrasias, severe hypertension, subacute bacterial endocarditis, acute nephritis, recent burn, spinal surgery, indwelling catheters, low weight (men <57 kg, women <45 kg), hypersensitivity to benzyl alcohol

**BLACK BOX WARNING:** Lumbar puncture, epidural/spinal anesthesia, aneurysm, coagulopathy

## DOSAGE AND ROUTES

### DVT/PE prophylaxis

**Adult (moderate risk—general surgery, nonsurgery 40-60 yr, major surgery <40 yr with no risk factors):** SUBCUT 20 mg/day
**Adult (higher risk—abdominal surgery, elderly-general surgery, major surgery <40 yr with no risk factors):** SUBCUT 30 mg q12hr or 40 mg/day

### DVT prevention before hip/knee surgery

**Adult:** SUBCUT 30 mg bid given 12-24 hr postoperatively for 7-10 days until DVT risk is diminished

### DVT prevention before hip replacement
**Adult:** SUBCUT 40 mg/day started 9-15 hr preop or 30 mg q12hr started 12-24 hr postop, continued until DVT risk is diminished or patient is adequately on anticoagulant

### DVT prophylaxis before abdominal surgery
**Adult:** SUBCUT 40 mg/day × 7-10 days to prevent thromboembolic complications, start 24 hr before surgery

### Treatment of DVT/PE
**Adult:** SUBCUT (outpatient without PE) 1 mg/kg q12hr or 1.5 mg/kg/day (outpatient/inpatient); warfarin should be started within 72 hr and continued ≥5 days until INR is 2-3 (at least 3)

### Prevention of ischemic complications in unstable angina/non–Q-wave/non-ST MI with aspirin
**Adult:** SUBCUT/**IV** 1 mg/kg q12hr until stable with aspirin 100-325 mg/day × ≥2 days

### Renal dose
**Adult:** SUBCUT CCr <30 ml/min: 30 mg q day (thrombosis prophylaxis in abdominal surgery, hip or knee replacement surgery, during acute illness); 1 mg/kg q day (concurrently with aspirin to treat unstable angina or non-Q-wave myocardial infarction); 1 mg/kg q day (STEMI in those ≥75 yrs, 30 mg IV bolus plus 1 mg/kg SC then 1 mg/kg q day (STEMI in those <75 yrs, or 1 mg/kg q day (concurrently with warfarin for inpatient or outpatient treatment of acute deep vein thrombosis (with or without pulmonary embolism)

**Available forms:** Prefilled syringes/inj 30 mg/0.3 ml, 40 mg/0.4 ml, 60 mg/0.6 ml, 80 mg/0.8 ml, 100 mg/1 ml, 120 mg/0.8 ml, 150 mg/ml; multidose vials 100 mg/ml (3 ml)

### Implementation
- Give at same time each day to maintain steady blood levels

**SUBCUT route**
- Administer SUBCUT deeply; do not give IM, begin 1 hr before surgery, do not aspirate, do not expel bubble from syringe before administration; sol is clear to yellow; do not use sol with precipitate; apply gentle pressure for 1 min, do not use products with benzyl alcohol in pregnant women
- Give to recumbent patient, rotate sites (left/right anterolateral, left/right posterolateral abdominal wall)
- Leave vascular access sheath in place for 6 hr after dose, then give next dose 6 hr after sheath removed

**Direct IV route**
- Use multidose vial for **IV** administration; use TB syringe or other graduated syringe to measure dose; give **IV** BOL through **IV** line; flush after
- If withdrawing from multidose vial, use TB syringe for proper measurement
- Prefilled syringes (30, 40 mg) are not graduated; do not use for partial doses
- Do not mix with other products or infusion fluids
- Give only this product when ordered; not interchangeable with heparin or LMWHs

## ADVERSE EFFECTS
**CNS:** Fever, confusion
**GI:** Nausea
**HEMA:** Hemorrhage from any site, hypochromic anemia, thrombocytopenia, bleeding
**INTEG:** Ecchymosis, inj site hematoma
**META:** Hyperkalemia in renal failure
**MS:** Osteoporosis
**SYST:** Edema, peripheral edema, angioedema, anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (90%) |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys; IV unknown |
| **Half-life** | 4½ hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 3-5 hr |
| **Duration** | Unknown |

## INTERACTIONS
### Drug classifications
Anticoagulants, antiplatelets, NSAIDs, RU-486, SSRIs, monitor INR/PT salicylates, thrombolytics: increased bleeding

### Drug/herb
Feverfew, garlic, ginger, ginkgo, horse chestnut: increased bleeding risk

### Drug/lab test
Increased: AST/ALT
Decreased: platelets

## NURSING CONSIDERATIONS
### Assessment
- Monitor antifactor Xa activity in chronic therapy (renal disease)
- **Pregnancy/breastfeeding:** Do not use multidose vials, benzyl alcohol is present, do not breastfeed
- Monitor blood studies (Hct, CBC, coagulation studies, occult blood in stools), anti-Xa levels

q3mo; platelet count q2-3day; thrombocytopenia may occur, PT, PTT, is not needed in those with adequate coagulation; discontinue and notify prescriber if platelets <100
• Assess patient for bleeding gums, petechiae, ecchymosis, black tarry stools, hematuria, epistaxis, decrease in B/P; indicate bleeding and possible hemorrhage; notify prescriber immediately

**BLACK BOX WARNING:** Assess for **neuroleptic symptoms** in patients who have received spinal anesthesia, may develop spinal hematoma, those who have had trauma, spinal surgery are at greater risk

• **Anaphylaxis, angioedema:** Assess for rash, fever, chills, swelling of face, lips, or tongue, dyspnea; stop product, initiate emergency procedures
• **Neurologic status:** those with epidural catheters are at greater chance for impairments
• **Injection site reactions:** Assess for inflammation, redness, hematomas

### Patient/family education
• **Spinal anesthesia:** Teach patient to report numbness, weakness in lower extremities
• Warn patient to avoid OTC preparations unless directed by prescriber because they could cause serious product interactions, not to start any Rx, OTC, supplements, or herbal products unless approved by prescriber
• Instruct patient to use soft-bristled toothbrush to avoid bleeding gums; to avoid contact sports; to use electric razor; to avoid IM inj
• **Advise patient to report any signs of bleeding, bruising:** gums, under skin, urine, stools, dizziness, rash, breathing changes, do not rub injection site
• **Beers:** Reduce dose in older adults, increased bleeding risk, or if CCr ≤30 ml/min

### Evaluation
**Positive therapeutic outcome**
• Absence of DVT/PE

**RARELY USED**

## entacapone (Rx)
(en-ta′ka-pone)
**Comtan**
*Func. class.:* Antiparkinsonian agent
*Chem. class.:* COMT (Catechol-O- methyltransferase inhibitor)

**ACTION:** Inhibits COMT (catechol *O*-methyltransferase) and alters the plasma pharmacokinetics of levodopa; given with levodopa/carbidopa

**Therapeutic outcome:** Decreased symptoms of Parkinson's disease (involuntary movements)

## USES:
Parkinsonism in those experiencing end of dose, decreased effect as an adjunct to levodopa/carbidopa

## CONTRAINDICATIONS
Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, renal/hepatic disease, affective disorders, psychosis

## DOSAGE AND ROUTES
**Adult:** PO 200 mg given with carbidopa/levodopa, max 1600 mg/day; may allow 25% dosage reduction in levodopa therapy

**Available forms:** Tabs 200 mg film coated

### Implementation
• Adjust dosage to patient response
• Give with meals to decrease GI upset; limit protein taken with product
• Give only after MAOIs have been discontinued for 2 wk

## ADVERSE EFFECTS
**CNS:** *Involuntary choreiform movements, dyskinesia, hypokinesia, hyperkinesia, hand tremors, fatigue, headache, anxiety, twitching, numbness, weakness, confusion, agitation, nightmares,* psychosis, hallucinations, hypomania, severe depression, dizziness, neuroleptic malignant syndrome
**CV:** *Orthostatic hypotension*
**GI:** *Nausea, vomiting, anorexia, abdominal distress, dry mouth, flatulence,* gastritis, GI disorder, *diarrhea, constipation,* bitter taste
**INTEG:** Rash, sweating, alopecia
**MISC:** Dark urine and other body fluids, back pain, dyspnea, purpura, fatigue, asthenia, infection-bacterial, rhabdomyolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Protein binding 98% |
| **Metabolism** | Liver extensively |
| **Excretion** | Kidneys, feces; breast milk |
| **Half-life** | 0.5 hr initial, 2.5 hr second |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | ≤8 hr |

## INTERACTIONS

### Individual drugs

Ampicillin, chloramphenicol, erythromycin, probenecid, rifampin: decreased excretion of entacapone

Bitolterol, DOBUTamine, DOPamine, EPHINEPHrine, isoetharine, methyldopa, norepinephrine: increased CV reactions; avoid use

### Drug classifications

MAOIs: prevent catecholamine metabolism; do not use together

### Drug/herb

Kava: decreased effect

Ma huang: increased B/P

## NURSING CONSIDERATIONS

### Assessment

- **Assess for neuroleptic malignant syndrome:** high temp, increased CPK, rigidity, change in consciousness, usually during rapid withdrawal, do not combine with SSRIs or MAOIs
- **Diarrhea:** Occurs between 4 and 12 wk of treatment
- Monitor B/P, respiration during initial treatment; hypotension should be reported
- Assess mental status: affect, mood, behavioral changes, depression; complete suicide assessment
- Monitor liver function enzymes: AST, ALT, alkaline phosphatase; also check LDH, bilirubin, CBC
- **Assess for involuntary movements in parkinsonism:** akinesia, tremors, staggering gait, muscle rigidity, drooling; these symptoms should improve with therapy when given with levodopa/carbidopa
- **Rhabdomyolysis:** Assess for muscle pain, tenderness, weakness, swelling of affected muscles, may lead to decreased B/P, shock

### Patient/family education

- Advise patient that hallucinations, mental changes, nausea, dyskinesia can occur
- Caution patient to change positions slowly to prevent orthostatic hypotension; not to drive or operate machinery until stabilized on medication and mental performance is not affected
- Instruct patient to use product exactly as prescribed; if dose is missed, take as soon as remembered, up to 2 hr before next dose, not to discontinue abruptly, withdraw gradually
- Inform patient that urine, sweat may darken
- Instruct patient to notify prescriber if pregnancy is suspected; if breastfeeding, product is excreted in breast milk

### Evaluation

#### Positive therapeutic outcome

- Decreased akathisia, other involuntary movements when used with levodopa/carbidopa
- Increased mood when used with levodopa/carbidopa

## entecavir (Rx)

(en-te'ka-veer)

**Baraclude**

*Func. class.:* Antiretroviral nucleoside reverse transcriptase inhibitors (NRTIs)

*Chem. class.:* Guanosine nucleoside analog

E

**ACTION:** Inhibits hepatitis B virus DNA polymerase by competing with natural substrates and by causing DNA termination after its incorporation into viral DNA; causes viral DNA death

**Therapeutic outcome:** Improved liver function tests in chronic hepatitis B (HBV)

**USES:** Chronic hepatitis B (HBV)

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, child, geriatric, severe renal disease, liver transplant

**BLACK BOX WARNING:** Hepatic disease, hepatitis, lactic acidosis, HIV

## DOSAGE AND ROUTES

### Chronic hepatitis B (nucleoside treatment–naive)

**Adult and adolescent ≥16 yr:** PO tab 0.5 mg/day

**Adult:** PO (solution) 0.5 mg qday

**Child/adolescent ≥2 yr, >30 kg:** 0.5 mg (10 mL) qday

**Child ≥2 yr, 27 to 30 kg:** 0.45 mg (9 mL) qday

**Child ≥2 yr, 24 to 26 kg:** 0.4 mg (8 mL) qday

**Child ≥2 yr, 21 to 23 kg:** 0.35 mg (7 mL) qday

**Child ≥2 yr, 18 to 20 kg:** 0.3 mg (6 mL) qday

**Child ≥2 yr, 15 to 17 kg:** 0.25 mg (5 mL) qday

**Child ≥2 yr, 12 to 14 kg:** 0.2 mg (4 mL) qday

**Child ≥2 yr:** 0.15 mg (3 mL) qday

### Chronic hepatitis B with compensated liver disease

**Adult and adolescent ≥16 yr:** PO tab 1 mg/day

**Adult:** PO (solution) 1 mg qday

**Child/adolescent ≥2 yr, >30 kg:** 1 mg (20 mL) qday

**Child ≥2 yr, 27 to 30 kg:** 0.9 mg (18 mL) qday

**Child ≥2 yr, 24 to 26 kg:** 0.8 mg (16 mL) qday

**Child ≥2 yr, 21 to 23 kg:** 0.7 mg (14 mL)

**Child ≥2 yr, 18 to 20 kg:** 0.6 mg (12 mL) qday

**Child ≥2 yr, 15 to 17 kg:** 0.5 mg (10 mL) qday

**Child ≥2 yr, 12 to 14 kg:** 0.4 mg (8 mL) qday

**Child ≥2 yr, 10 to 11 kg:** 0.3 mg (6 mL) qday

### Renal dose

**Adult and child >16 yr:** PO CCr ≥50 ml/min 0.5 mg/day; CCr 30-49 ml/min 0.25 mg daily, 0.5 mg/day or 1 mg q48hr for lamiVUDine refractory patient; CCr 10-29 ml/min 0.15/day, 0.3 for lamiVUDine refractory patient; CCr <10 ml/min 0.05 mg PO/day, 0.1 mg/day or 1 mg q7days for lamiVUDine refractory patient

**Available forms:** Tabs, film coated 0.5, 1 mg; oral sol 0.05 mg/ml

### Implementation

- After hemodialysis give by mouth on empty stomach 2 hr before or after food
- Tabs: Store at room temperature
- **Oral liquid:** Use calibrated oral dosing spoon provided, may be used interchangeably with tabs, do not dilute
- Store in cool environment; protect from light

## ADVERSE EFFECTS

**CNS:** *Headache*, fatigue, dizziness, insomnia
**ENDO:** Hyperglycemia
**GI:** *Dyspepsia*, nausea, vomiting, diarrhea, elevated liver function enzymes, hepatotoxicity with steatosis
**INTEG:** Alopecia, rash
**SYST:** Lactic acidosis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 100% |
| **Distribution** | Extensively to tissues, protein binding 13% |
| **Metabolism** | Unknown |
| **Excretion** | Unchanged 62%-73% via kidneys |
| **Half-life** | Terminal 128-149 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 0.5-1.5 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug/food

High-fat meal: decreased absorption

### Drug/lab test

Increased: ALT, AST, total bilirubin, amylase, lipase, creatinine, blood glucose, urine glucose
Decreased: platelets, albumin

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Assess **for HIV** before beginning treatment because HIV resistance may occur in patients with chronic hepatitis B infection; monitor HIV RNA, do not use in those with HIV and HBV unless receiving antiretroviral treatment for both

**BLACK BOX WARNING:** Assess for **lactic acidosis and severe hepatomegaly with stenosis:** increased serum lactate, increased hepatic enzymes, palpate liver; discontinue product if these occur, may be fatal

- Monitor geriatric patients more carefully; may develop renal, cardiac symptoms more rapidly

**BLACK BOX WARNING:** Assess **for exacerbations of hepatitis** (jaundice, pruritus, fatigue, anorexia) after discontinuing treatment; and for several months monitor liver function tests

- Use if clearly needed, register pregnant woman at the Antiretroviral Pregnancy Registry at 800-258-4263. To reduce the risk of postnatal transmission, HIV-infected mothers are advised to avoid breastfeeding

### Patient/family education

- Teach patient not to take with food
- Teach patient to take exactly as prescribed, read the "Patient Information," take missed dose when remembered unless close to time of next dose, that compliance with dosage schedule is required, do not share product
- Advise patient not to stop medication without approval of prescriber
- Advise that optimal duration of treatment is unknown
- Teach patient to avoid use with other medications, supplements unless approved by prescriber
- Teach patient to notify prescriber of decreased urinary output, blood in urine

**BLACK BOX WARNING: Teach patient symptoms of lactic acidosis:** muscle pain, severe tiredness, weakness, trouble breathing, stomach pain with nausea/vomiting, coldness in arms/legs, fast/irregular heartbeat, dizziness

**BLACK BOX WARNING: Teach patient symptoms of hepatotoxicity:** eyes/skin turns yellow, dark urine, light bowel movements, no appetite for days, nausea, stomach pain, may be worsened after discontinuing treatment

• Advise patient that product does not cure, but lowers the amount of HBV in body
• Teach patient that product does not stop the spreading of HBV to others by sex, sharing needles, or being exposed to blood
• Teach patient to notify prescriber if pregnancy is planned or suspected, not to breastfeed
• Teach patient not to operate machinery until effect is known, dizziness may occur
• Inform patient that regular follow-up and lab tests will be needed

### Evaluation

**Positive therapeutic outcome**

• Decreased symptoms of chronic hepatitis B, improving liver function tests

**RARELY USED**

## enzalutamide

(en-zal-u'ta-mide)

**Xtandi**

*Func. class.:* Antineoplastic hormone

*Chem. class.:* Nonsteroidal antiandrogen

**Therapeutic outcome:** Decreased tumor size, decreased spread of malignancy

**USES:** Metastatic castration-resistant prostate cancer in those who have received DOCEtaxel

### CONTRAINDICATIONS

Pregnancy, women, hypersensitivity

### DOSAGE AND ROUTES

**Adult: PO** 160 mg (4 × 40-mg caps) daily

If a patient experiences a grade 3 or higher toxicity or an intolerable adverse effect, withhold dosing for 1 wk or until symptoms improve to grade 2 or less, then resume at the same or a reduced dosage (120 or 80 mg), if warranted

The concomitant use of strong cytochrome P450 (CYP-450) 2C8 inhibitors should be avoided if possible; if a strong CYP2C8 inhibitor must be coadministered, reduce the enzalutamide dosage to 80 mg once daily

**Available forms:** TABs 40 mg

## epinastine ophthalmic

*See Appendix B*

**⚠ HIGH ALERT**

## EPINEPHrine (Rx, OTC)

(ep-i-nef'rin)

**Adrenaclick, Primatene Mist, Twinject, Walgreens Bronchial Mist**

## EPINEPHrine HCl

**Adrenalin, EpiPen, EpiPen Jr.**

*Func. class.:* Bronchodilator, nonselective adrenergic agonist, cardiac stimulant, vasopressor

*Chem. class.:* Catecholamine

**Do not confuse:** EPINEPHrine/ePHEDrine

**ACTION:** $\beta_1$- and $\beta_2$-agonist causing increased levels of cyclic AMP producing bronchodilatation, cardiac and CNS stimulation; large doses cause vasoconstriction via $\alpha$-receptors; small doses can cause vasodilation via $\beta_2$-vascular receptors

**Therapeutic outcome:** Vasoconstrictor, cardiac stimulator, bronchodilator, decreased aqueous humor

**USES:** Acute asthmatic attacks, hemostasis, bronchospasm, anaphylaxis, allergic reactions, cardiac arrest, adjunct in anesthesia, shock

### CONTRAINDICATIONS

Hypersensitivity to sympathomimetics, sulfites, closed-angle glaucoma, nonanaphylactic shock during general anesthesia

**Precautions:** Pregnancy, breastfeeding, cardiac disorders, hyperthyroidism, diabetes mellitus, prostatic hypertrophy, hypertension, organic brain syndrome, local anesthesia of certain areas, labor, cardiac dilatation, coronary insufficiency, cerebral arteriosclerosis, organic heart disease

### DOSAGE AND ROUTES

**Anaphylaxis/severe asthma exacerbation**

**Adult: IM/SUBCUT** 0.3-0.5 mg, may repeat q10-15 min (anaphylaxis) or q20min-4 hr (asthma)

**Severe allergic reactions type 1**

**Adult/child ≥30 kg: IM** 0.3 mg (EpiPen/EpiPen 2-Pak, 1:1000)

**Child <30 kg: IM** 0.15 mg (EpiPen Jr/EpiPen Jr 2-Pak 1:2000)

**Adult/child ≥66 lb:** IM/SUBCUT 0.3 mg (0.3 ml) initially (Twinject 1.1 ml 1:1000, 1 mg/ml, containing 2 doses of 0.3 mg)

**Adult/child 33-66 lb:** IM/SUBCUT 0.15 mg (0.15 ml) initially, may give another 0.15 mg after 10 min (Twinject 1.1 ml 1:1000 [1 mg/ml] containing 2 doses of 0.15 mg)

### Status asthmaticus

**Adult/adolescent:** SUBCUT 0.3-0.5 mg q20min ×3 doses

**Child/infant:** SUBCUT 0.01-0.5 mg/kg q20min ×3 doses

**Available forms:** Nasal spray (sol) 1 mg/ml; sol for inj 1 mg/ml; inh vapor (sol) 0.22 mg/actuation; pressurized inh (sol) 0.22 mg/actuation; sol for inj 0.15 mg/0.15 ml autoinjector, 0.3 mg/0.3 ml autoinjector, 0.15 mg/0.3 ml

### Implementation

- Give subcut, IM, intraosseously, IV; suspensions are for subcut use only; do not give IV
- Visually inspect parenteral products for particulate matter and discoloration prior to use; do not use solutions that are pinkish to brownish in color or contain a precipitate
- Avoid extravasation during parenteral administration; if extravasation occurs, infiltrate the affected area with phentolamine diluted in NS
- Death has occurred from drug errors; make sure the right concentration is used
- Store reconstituted sol refrigerated 24 hr

**Direct IV injection route**

- Inject EPINEPHrine directly into a vein over 5-10 min for adults or 1-3 min for children; may be given IV push in cardiac arrest
- In neonates, may administer via the umbilical vein
- During adult cardiopulmonary resuscitation (CPR): resuscitation drugs may be given IV by bolus injection into a peripheral vein, followed by an injection of 20 ml IV fluid; elevate the extremity for 10-20 sec to facilitate drug delivery to the central circulation

**Continuous IV infusion route**

- Dilute 1 mg EPINEPHrine in 250 or 500 ml of a compatible IV infusion solution to provide a concentration of 4 or 2 mcg/ml, respectively; give into a large vein, if possible
- More concentrated solutions (16-32 mcg/ml) may be used in fluid-restricted patients when administered through a central line

**IM route**

- EPINEPHrine injection should preferably be into the deltoid or anterior thigh (vastus lateralis); do not administer into the gluteal muscle
- Twinject is light-sensitive and should be stored in the carrying case provided; do not refrigerate; protect from freezing; replace if solution is discolored or contains a precipitate

**Subcut route**

- Inject taking care not to inject intradermally
- Massage injection site well after use to enhance absorption and to decrease local vasoconstriction; injection can cause tissue irritation

**Intraosseous infusion route (unlabeled)**

- During CPR, the same EPINEPHrine dosage may be given via the intraosseous route when IV access is not available

**Intracardiac route**

- Should be reserved for extreme emergencies. Intracardiac injection should only be performed by properly trained medical personnel

**Inhalation route**

- Use 2.25% sol diluted in nebulizer/respirator
- Rinse mouth after inh
- 10 drops of a 1% sol should be placed in nebulizer
- Dilute racepinephrine 2.25% sol

**Endotracheal route**

- Per the ACLS or PALS guidelines, the EPINEPHrine parenteral product is administered via this route
- Endotracheal (ET) administration should only be used if access to IV or intraosseous routes is not possible
- **Adult:** Dilute dose in 5-10 ml NS or sterile distilled water; administer via ET tube; endotracheal absorption of EPINEPHrine may be improved by diluting with water instead of NS
- **Child:** After dose administration, flush the ET tube with a minimum of 5 ml NS

**Y-site compatibilities:** Alfentanil, amikacin, amiodarone, amphotericin B liposome, anidulafungin, ascorbic acid, atracurium, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, ceFAZolin, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, cisatracurium, CISplatin, clindamycin, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, DOXOrubicin, doxycycline, enalaprilat, epirubicin, epoetin, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, folic acid, furosemide, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, ifosfamide, imipenem/cilastatin, isoproterenol, ketorolac, labetalol, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, meperidine, metaraminol, methicillin, methotrexate, methoxamine, methyldopa, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, minocycline, mitoXANtrone, morphine, multiple vitamins, nafcillin, nalbuphine, naloxone, niCARdipine, nitroglycerin, nitroprusside, norepinephrine,

octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pancuronium, pantoprazole, PEMEtrexed, penicillin G potassium, pentamidine, pentazocine, phentolamine, phenylephrine, phytonadione, piperacillin-tazobactam, potassium chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, pyridoxine, quinupristin/dalfopristin, ranitidine, remifentanil, ritodrine, rocuronium, sodium acetate, streptomycin, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin/clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, trimethaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, vitamin B complex with C, voriconazole, warfarin, zoledronic acid

**Y-site incompatibilities:** Acyclovir, aminophylline, azaTHIOprine, carmustine, cephapirin, dantrolene, diazepam, diazoxide, fluorouracil, ganciclovir, gemtuzumab, indomethacin, micafungin, PENTobarbital, PHENobarbital, phenytoin, sodium bicarbonate, thiopental, sulfamethoxazole/trimethoprim

## ADVERSE EFFECTS

**CNS:** *Tremors, anxiety,* insomnia, headache, dizziness, weakness, drowsiness, confusion, hallucinations, cerebral hemorrhage
**CV:** *Palpitations, tachycardia,* hypertension, *dysrhythmias,* increased T wave
**GI:** *Anorexia, nausea, vomiting*
**MISC:** Sweating, dry eyes
**RESP:** *Dyspnea,* paradoxical bronchospasm (inhalation)
**META:** Hypoglycemia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO), complete (**IV**) |
| **Distribution** | Unknown, crosses placenta |
| **Metabolism** | Liver |
| **Excretion** | Breast milk |
| **Half-life** | Unknown |

### Pharmacodynamics

| | SUBCUT | IM | IV | INH |
|---|---|---|---|---|
| **Onset** | 3-5 min | Variable | Immediate | 1 min |
| **Peak** | Unknown | Unknown | Unknown | Unknown |
| **Duration** | 1-4 hr | 1-4 hr | Unknown | 1-4 hr |

## INTERACTIONS

### Drug classifications

β-Adrenergic blockers: decreased hypertensive effects, stop β blocker 3 days before starting product
Antidepressants (tricyclics): increased chance of hypertensive crisis; do not use together
MAOIs: increased chance of hypertensive crisis, do not use together
Other sympathomimetics: toxicity
α blockers: Increase: hypotension-antihistamines, thyroid replacement hormones: Increased: cardiac effects
Cardiac glycosides: Increase: dysrhythmias

## NURSING CONSIDERATIONS

### Assessment

- **Asthma:** Monitor respiratory function: vital capacity, forced expiratory volume, ABGs, lung sounds, heart rate, rhythm (baseline); amount, color of sputum
- Epinephrine crosses the placenta. There are no adequate and well-controlled studies in pregnant women. Epinephrine should be used with extreme caution during active labor and obstetric delivery. Although it can improve maternal hypotension associated with anaphylaxis, it may result in uterine vasoconstriction, decreased uterine blood flow, and fetal anoxia. Avoid use of epinephrine during the second stage of labor; epinephrine may cause a prolonged period of uterine atony with hemorrhage at dosages sufficient to reduce uterine contractions. Avoid use if the maternal blood pressure exceeds 130/80 mm Hg; it is not known whether epinephrine is excreted in human milk. Epinephrine is rapidly inactivated in the body, suggesting that any excreted in breast milk would not likely affect the infant. Caution should be exercised when administering epinephrine to a breastfeeding woman; consider the route of administration and dosage when assessing the risk to the nursing infant
- **Vasopressor:** Monitor during administration continuously; if B/P increases, product should be decreased; check B/P, pulse q5min after parenteral route; CVP, PCWP, SVR; inadvertent high arterial B/P can result in angina, aortic rupture, cerebral hemorrhage
- Check inj site for tissue sloughing; if this occurs, administer phentolamine mixed with 0.9% NaCl
- **Monitor for evidence of allergic reactions, paradoxical bronchospasm:** (swelling of face/lips/eyelids, rash, difficulty breathing) withhold dose, notify prescriber; sulfite sensitivity, which may be life threatening

### Patient/family education

- Identify if pregnancy is planned or suspected, if breastfeeding
- Tell patient not to use OTC medications; extra stimulation may occur; to use this medication before other medications and allow at least 5 min between each, to prevent overstimulation
- Teach patient that paradoxical bronchospasm may occur and to stop product immediately and notify prescriber; to limit caffeine products such as chocolate, coffee, tea, and colas
- **Inhalation:** Patient should rinse mouth after inh
- Patient should report blurred vision, irritation with ophth preparations
- **Autoinjector:** Teach patient how to use for anaphylaxis, remove cap, place black tip on thigh at 45-degree angle, hold 10 sec, remove

### Evaluation

**Positive therapeutic outcome**

- Absence of dyspnea, wheezing, relief of bronchospasm
- Improved airway exchange, improved ABGs
- Decreased aqueous humor
- Stabilization of heart rate and cardiac output

## TREATMENT OF OVERDOSE:

Administer a $\beta_2$-adrenergic blocker, vasodilators, $\alpha$-blocker

## EPINEPHrine nasal agent

*See Appendix B*

**⚠ HIGH ALERT**

## epirubicin (Rx)

(ep-i-roo'bi-sin)

**Ellence, Pharmorubicin**

*Func. class.:* Antineoplastic, antibiotic

*Chem. class.:* Anthracycline

**Do not confuse:** epirubicin/DOXOrubicin/DAUNOrubicin/eribulin/IDArubicin

**ACTION:** Inhibits DNA synthesis primarily; replication is decreased by binding to DNA, which causes strand splitting; maximum cytotoxic effects at S and $G_2$ phases; a vesicant

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** Breast cancer as an adjuvant therapy, with axillary node involvement, after resection

**Unlabeled uses:** Used in combination for treatment of advanced forms of cancer

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity to this product, anthracyclines, anthracenediones, baseline neutrophil count $<1500$ cell/mm$^3$, severe myocardial insufficiency, recent MI, heart failure, cardiomyopathy

**BLACK BOX WARNING:** Severe hepatic disease, IM/subcut

**Precautions:** Children, geriatric, renal/hepatic/cardiac disease, previous anthracycline use, accidental exposure, angina, dental disease, herpes, hyperkalemia, hyperphosphatemia, hypertension, hyperuricemia, hypocalcemia, infection, infertility, tumor lysis syndrome, ventricular dysfunction

**BLACK BOX WARNING:** Bone marrow suppression (severe), heart failure, extravasation, secondary malignancy, requires an experienced clinician

## DOSAGE AND ROUTES

### Breast cancer with axillary node involvement following resection of the primary tumor in combination with cyclophosphamide and fluorouracil

**Adult: IV** 100 mg/m$^2$ on day 1 with fluorouracil and cyclophosphamide (FEC regimen) q21 days $\times$ 6 cycles or 60 mg/m$^2$ on days 1 and 8 with oral cyclophosphamide and fluorouracil q28 days $\times$ 6 cycles

### Breast cancer in combination with cyclophosphamide

**Adult: IV** 60 mg/m$^2$ day 1 with cyclophosphamide (500 mg/m$^2$ IV day 1), repeated q21 days $\times$ 8 cycles, or a higher-dose regimen of epirubicin 100 mg/m$^2$ IV day 1 with cyclophosphamide (830 mg/m$^2$ IV day 1), q21 days $\times$ 8 cycles

**Dosage adjustments based upon hematologic and non-hematologic toxicities:** Nadir platelet counts $<50{,}000$/mm$^3$ absolute neutrophil counts (ANC) $<250$/mm$^3$, neutropenic fever, or Grades 3/4 non-hematologic toxicities: Day 1 dose in subsequent cycles should be reduced by 25% of the previous dose

**For patients receiving divided-dose epirubicin (i.e., day 1 and 8):** Day 8 dose should be reduced by 25% of the day 1 dose if the platelet counts are 75,000-100,000/mm$^3$ and the ANC is 1000-1499/mm$^3$; if day 8 platelet counts are $<75{,}000$/mm$^3$, ANC $<1000$/mm$^3$, or Grade 3/4 nonhematologic toxicity has occurred, omit the day 8 dose

### Hepatic dose

**Adult: IV** Bilirubin 1.2-3 mg/dl or AST 2-4 $\times$ normal upper limit, 50% of starting dose; bilirubin $>3$ mg/dl or AST $>4$ $\times$ normal upper limit, 25% of starting dose

**Available forms:** Inj (2 mg/ml) 10 mg/5 ml, 50 mg/25 ml, 150 mg/75 ml, 200 mg/100 ml

## Implementation

- Avoid contact with skin; very irritating; wash completely to remove; give fluids **IV** or PO before chemotherapy to hydrate patient
- Give antiemetic 30-60 min before giving product to prevent vomiting and prn
- Administer prophylactic antibiotic with a fluoroquinolone or trimethoprim/sulfamethoxazole if dose of epirubicin is 120 mg/m$^2$
- Provide liquid diet: carbonated beverages; gelatin may be added if patient is not nauseated or vomiting; monitor electrolytes

**BLACK BOX WARNING:** To be used by a clinician experienced in giving cytotoxic products

**BLACK BOX WARNING:** Do not use IM/subcut due to severe tissue necrosis

**BLACK BOX WARNING:** Give IV, only, subcut; a vesicant: if extravasation occurs, stop and complete via another vein, preferably in another limb; avoid infusion into veins over joints or in extremities with compromised venous or lymphatic drainage

- Rapid injection may cause facial flushing or erythema along the vein; avoid administration time of less than 3 min
- Product should be given to those with neutrophils ≥1500/mm$^3$, platelet count ≥100,000/mm$^3$, and non-hematologic toxicities recovered to ≤Grade 1
- When refrigerated, the preservative-free, ready-to-use solution may form a gelled product; and will return to solution after 2-4 hr at room temperature
- Visually inspect for particulate matter and discoloration prior to use
- Double-check dose and product, fatalities have occurred with wrong dose or product
- Give antiinfectives before using this product

### IV route

- Product should be prepared by experienced personnel using proper precautions; pregnant women must not handle product
- Reconstitute 50 mg and 200 mg powder for injection vials with 25 ml and 100 ml, respectively, of sterile water for injection (2 mg/ml), shake vigorously for up to 4 min; reconstituted solutions are stable for 24 hr when stored refrigerated and protected from light or at room temperature in normal light
- Solution can be further diluted with sterile water for injection

### IV injection route

- Give doses of 100-120 mg/m$^2$ into tubing of a freely flowing 0.9% sodium chloride (NS) or $D_5W$ IV infusion over 15-20 min; the infusion time may be decreased, proportionally, in those who require lower doses; infusion times <3 min are not recommended
- Direct injection into the vein is not recommended due to the risk of extravasation; avoid use with any solution of alkaline pH as hydrolysis will occur

### IV infusion route

- Dilute dose in 0.9% sodium chloride (NS) or $D_5W$; infuse over 30-60 min
- Avoid use with any solution of alkaline pH as hydrolysis will occur

**Y-site compatibilities:** Alemtuzumab, alfentanil, amifostine, amikacin, aminocaproic acid, anidulafungin, argatroban, atracurium, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, ceFAZolin, cefotaxime, ceftizoxime, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, cyclophosphamide, cycloSPORINE, DAPTOmycin, dexrazoxane, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doxacurium, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, ertapenem, erythromycin, etoposide, famotidine, fenoldopam, fentaNYL, fluconazole, gatifloxacin, gemcitabine, gentamicin, granisetron, haloperidol, hydrocortisone, HYDROmorphone, hydrOXYzine, ifosfamide, imipenem-cilastatin, inamrinone, insulin (regular), isoproterenol, labetalol, levofloxacin, levorphanol, lidocaine, linezolid, LORazepam, mannitol, meperidine, mesna, methotrexate, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, minocycline, mitoMYcin, mivacurium, morphine, moxifloxacin, nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ofloxacin, ondansetron, oxaliplatin, PACLitaxel, palonosetron, pamidronate, pancuronium, pentamidine, pentazocine, phenylephrine, potassium chloride, procainamide, prochlorperazine, promethazine, propranolol, quinupristin-dalfopristin, ranitidine, remifentanil, rocuronium, sodium acetate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiotepa, tigecycline, tirofiban, tobramycin, trimethobenzamide, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

**Y-site incompatibilities:** Acyclovir, allopurinol, aminophylline, amphotericin B colloidal, amphotericin B lipid complex, amphotericin B liposome, ampicillin, ampicillin/sulbactam, azithromycin, cefepime, cefoperazone, cefoTEtan, cefOXitin, cefTAZidime, cefTRIAXone, cefuroxime, dexamethasone, diazepam, ertapenem, fluorouracil, foscarnet, fosphenytoin, furosemide, ganciclovir, gemtuzumab, heparin, hydrocortisone, ketorolac, leucovorin, magnesium sulfate, meropenem, methohexital, methylPREDNISolone, nafcillin, pantoprazole, PEMEtrexed, PENTobarbital, PHENobarbital, phenytoin, piperacillin/tazobactam, potassium phosphates, sodium bicarbonate, sodium phosphates, thiopental, ticarcillin/clavulanate, tigecycline, sulfamethoxazole/trimethoprim

## ADVERSE EFFECTS

**CV:** Increased B/P, sinus tachycardia, PVCs, chest pain, bradycardia, extrasystole, cardiomyopathy

**GI:** Nausea, vomiting, diarrhea, anorexia, mucositis

**GU:** *Hot flashes, amenorrhea, hyperuricemia,* red urine

**HEMA:** Thrombocytopenia, leukopenia, anemia, neutropenia, secondary AML

**INTEG:** *Rash, necrosis, pain at inj site, reversible alopecia*

**MISC:** Infection, febrile neutropenia, lethargy, fever, conjunctivitis, tumor lysis syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete bioavailability |
| **Distribution** | Widely distributed, crosses placenta |
| **Metabolism** | Liver, extensively |
| **Excretion** | Bile (60%) |
| **Half-life** | 3 min; 1hr; 30 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Cimetidine, radiation: increased toxicity

PACLitaxel: give epirubicin before PACLitaxel if given concurrently

Trastuzumab: increased ventricular dysfunction, HF

### Drug classifications

Antineoplastics: increased toxicity

Calcium channel blockers: increased heart failure

Live virus vaccines: decreased antibody response

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Heart failure:** monitor left ventricular ejection fraction, multigated acquisition scan or echocardiogram, ECG; watch for ST-T wave changes, low QRS and T; possible dysrhythmias (sinus tachycardia, heart block, PVCs) may occur; assess tachypnea, ECG changes, dyspnea, edema, fatigue; cardiac status: B/P, pulse, character, rhythm, rate, ABGs; identify cumulative amount of anthracycline received (lifetime); reactions that follow may be delayed; assess for dyspnea, tachycardia, peripheral edema, rales/crackles, ascites

- **Assess symptoms indicating severe allergic reaction:** rash, pruritus, urticaria, purpuric skin lesions, itching, flushing; product should be discontinued

**BLACK BOX WARNING: Bone marrow depression (severe):** monitor CBC, differential, platelet count weekly; withhold product if baseline neutrophil count is $<1500/mm^3$; notify prescriber of results if WBC $<20,000/mm^3$, platelets $<150,000/mm^3$; leukocyte nadir occurs 10-14 days after administration; recovery by 21st day; assess for bleeding: Hemanaturia, guaiac, bruising or petechiae in mucosa or orifices

- **Infection:** treat before receiving this product in regimens $>120$ mg/m$^2$; prophylactic antibiotics should be given (trimethoprim-sulfamethoxazole or a quinolone)
- Assess for increased uric acid levels, swelling, joint pain, primarily extremities; patient should be well hydrated to prevent urate deposits
- Monitor renal function studies: BUN, creatinine, serum uric acid, urine CCr before, during therapy; I&O ratio; report fall in urine output to $<30$ ml/hr; dosage adjustment is needed for serum creatinine $>5$ mg/dl

**BLACK BOX WARNING: Severe hepatic disease:** monitor liver function tests before, during therapy (bilirubin, AST, ALT, LDH) as needed or monthly; note jaundice of skin or sclera, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea

- Fetal harm may occur if given to a pregnant woman, based on animal studies. Women of reproductive potential should avoid becoming pregnant during therapy and should be advised to utilize effective contraceptive methods. If a woman becomes pregnant during therapy, she should be advised of the potential risks to the fetus. Because this

product may induce chromosomal damage in sperm, there is potential for male-mediated teratogenicity. Men with sexual partners of reproductive potential should use effective contraceptive methods during and after therapy. Men or women who receive this product may have a risk of infertility. Women treated may develop irreversible amenorrhea or premature menopause; discontinue breastfeeding or discontinue product

- Assess for bleeding: hematuria, stool guaiac, bruising or petechiae, mucosa or orifices q8hr; inflammation of mucosa, breaks in skin
- Identify effects of alopecia on body image; discuss feelings about body changes

**BLACK BOX WARNING: Extravasation (vesicant):** Assess for local irritation, pain, burning, necrosis at injection site; discontinue and start at another site

- **Stomatitis:** Assess oral mucosa for ulceration, burning, bleeding, may lead to inability to eat and swallow

### Patient/family education

- Advise patient to avoid use of products containing aspirin or NSAIDs, razors, commercial mouthwash, since bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools)
- Instruct patient to report signs of anemia (fatigue, headache, irritability, faintness, shortness of breath)
- Inform patient that hair may be lost during treatment; a wig or hairpiece may make patient feel better; new hair may be different in color, texture, new hair growth occurs in ≤3 mo after treatment
- Caution patient not to have any vaccinations without the advice of the prescriber; serious reactions can occur

**BLACK BOX WARNING:** Teach patient that irreversible myocardial damage, leukopenia, menopause may occur

- **Pregnancy/breastfeeding:** Advise patient to use contraception during treatment and 4 mo afterward; not to breastfeed
- Advise patient that urine may appear red for 2 days
- Instruct patient to avoid crowds, persons with known infection
- Caution patient to avoid OTC medications, supplements unless approved by prescriber
- Teach patient to report rapid heartbeat, trouble breathing, fever, nausea, vomiting, oral sores
- To report pain at site immediately

### Evaluation

**Positive therapeutic outcome**

- Prevention of rapid division of malignant cells

## eplerenone (Rx)

(ep-ler-ee′known)

**Inspra**

*Func. class.:* Antihypertensive

E

**Do not confuse:** Inspra/Spiriva

**ACTION:** Binds to mineralocorticoid receptor and blocks the binding of aldosterone, a component of the renin-angiotensin-aldosterone system (RAAS)

**Therapeutic outcome:** Absence of hypertension

**USES:** Hypertension, alone or in combination with thiazide diuretics, HF, post-MI

## CONTRAINDICATIONS

Hypersensitivity, increased serum creatinine >2 mg/dl (male) or >1.8 mg/dl (female), potassium >5.5 mEq/L, type 2 diabetes with microalbuminuria, hepatic disease, CCr <30 ml/min, CCr <50 ml/min in hypertension

**Precautions:** Pregnancy, breastfeeding, children, geriatric, impaired renal/hepatic function, hyperkalemia

## DOSAGE AND ROUTES

### Hypertension

**Adult: PO** 50 mg/day initially, may increase to 50 mg bid after 4 wk, max 100 mg/day; start dose at 25 mg/day if patient is taking CYP3A4 inhibitors

### HF/post-MI

**Adult:** PO 25 mg/day initially, may increase to 50 mg/day max

**Available forms:** Tabs 25, 50 mg

### Implementation

- Store in tight container at 86° F (30° C) or less
- **Dosage adjustments for those receiving moderate CYP3A4 inhibitors:** Potassium level 5 mEq/L, increase from 25 mg every other day to 25 mg/qday, or increase from 25 mg/qday to 50 mg qday.
- If potassium level is 5-5.4 mEq/L no adjustment; if potassium level is 5.5 to 5.9 mEq/L, decrease dose from 50 mg qday to 25 mg/qday to 25 mg every other day; withhold dose; If potassium level is >6 mEq/L withhold; may restart drug at 25 mg every other day when potassium level is <5.5 mEq/L

## ADVERSE EFFECTS

**CNS:** Headache, *dizziness, fatigue*
**CV:** Angina, MI
**GI:** Increased GGT *diarrhea,* abdominal pain, increased ALT
**GU:** Gynecomastia, mastodynia (males), abnormal vaginal bleeding
**META:** *Hyperkalemia,* hyponatremia, hypercholesteremia, hypertriglyceridemia, increased uric acid
**RESP:** *Cough*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 50% |
| **Metabolism** | Liver (CYP3A4) |
| **Excretion** | Urine, feces |
| **Half-life** | 4-6 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1½ hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Clarithromycin, imatinib, nelfinavir, nefazodone, ritonavir, troleandomycin: do not use concurrently
Erythromycin, fluconazole, verapamil: reduce dose of eplerenone; increased eplerenone levels
Itraconazole, ketoconazole, saquinavir, verapamil: increased levels of eplerenone; reduce dose of eplerenone
Lithium: increased serum lithium levels, monitor lithium level

### Drug classifications

ACE inhibitors, angiotensin II antagonists, diuretics (potassium-sparing), do not use together, NSAIDs, potassium supplements: increased hyperkalemia
CYP3A4 inhibitors: increased levels of eplerenone; reduce dose of eplerenone
NSAIDs: decreased antihypertensive effect

### Drug/herb

Decreased antihypertensive effect: ephedra, St. John's wort

### Drug/food

Grapefruit, grapefruit juice: increased product level by 25%
• Do not use salt substitutes with potassium

### Drug/lab test

Increased: BUN, creatinine, potassium, cholesterol, lipids, uric acid
Decreased: sodium

## NURSING CONSIDERATIONS

### Assessment

• **Hypertension:** monitor B/P at peak/trough level of product, orthostatic hypotension, syncope when used with diuretic; those on moderate CYP3A4 inhibitors should monitor potassium at baseline, within first wk, and at 1 month and more often in diabetes, renal disease
• Monitor renal studies: protein, BUN, creatinine; increased liver function tests; uric acid may be increased, contraindicated in CCr <30 ml/min
• **Pregnancy/breastfeeding:** Use in pregnancy only if clearly needed, may be excreted in breast milk, discontinue breastfeeding or discontinue product
• Monitor potassium levels, hyperkalemia may occur

### Patient/family education

• Advise patient not to discontinue product abruptly
• Advise patient not to use OTC products (cough, cold, allergy) unless directed by prescriber; do not use salt substitutes containing potassium without consulting prescriber
• Teach patient the importance of complying with dosage schedule, even if feeling better
• Teach patient that product may cause dizziness, fainting, light-headedness; may occur during first few days of therapy
• Teach patient how to take B/P, normal readings for age group

### Evaluation

**Positive therapeutic outcome**

• Decrease in B/P

**⚠ HIGH ALERT**

## epoetin (Rx)

(ee-poe'e-tin)
**Epogen, Eprex, Procrit**
*Func. class.:* Antianemic, biologic modifier, hormone
*Chem. class.:* Amino acid polypeptide

**ACTION:** Erythropoietin is a factor controlling rate of red cell production; product is developed by recombinant DNA technology

**Therapeutic outcome:** Decreased anemia with increased RBCs

**USES:** Anemia caused by reduced endogenous erythropoietin production, primarily end-stage renal disease; to correct hemostatic defect in uremia; anemia caused by AZT (zidovudine) treatment in HIV-positive patients; anemia caused by chemotherapy; reduction of allogeneic blood transfusion in surgery patients

**Unlabeled uses:** Anemia in premature preterm infants

## CONTRAINDICATIONS

Hypersensitivity to mammalian cell–derived products or human albumin; uncontrolled hypertension

**Precautions:** Pregnancy, breastfeeding, children <1 mo, seizure disorder, porphyria, CV disease, hemodialysis, latex allergy, hypertension, history of CABG; multidose preserved formulation contains benzyl alcohol and should not be used in premature infants

**BLACK BOX WARNING:** Hgb >11 g/dl, surgery, neoplastic disease

## DOSAGE AND ROUTES

### Anemia due to chronic kidney disease including dialysis-dependent and dialysis-independent patients to decrease the need for red blood cell transfusion

**Adult/adolescent ≥17 yr:** SUBCUT/IV, initially, 50-100 units/kg 3×/wk; for patients on dialysis, administer IV and initiate treatment when hemoglobin (Hgb) is <10 g/dl. If Hgb approaches or exceeds 11 g/dl, reduce or interrupt the dose. For patients not on dialysis, consider initiating treatment only when Hgb is <10 g/dl and the rate of Hgb decline indicates the likelihood of requiring a RBC transfusion and reducing the risk of alloimmunization and/or other RBC transfusion-related risks is a goal. If Hgb is >10 g/dl, reduce or interrupt the dose, and use the lowest dose sufficient to reduce the need for RBC transfusions. If the Hgb rises >1 g/dl in any 2-wk period, reduce dose by 25% or more as needed to reduce rapid responses. In contrast, if Hgb has not increased >1 g/dl after 4 wk of therapy, increase the dose by 25%. For patients who do not respond adequately over a 12-wk escalation period, increasing the dose further is unlikely to improve response and may increase risks. Use the lowest dose that will maintain a Hgb concentration sufficient to reduce the need for RBC transfusions. Evaluate other causes of anemia, and discontinue if responsiveness does not improve

**Adolescent ≤16 yr/child/infant:** SUBCUT/IV 50 units/kg 3×/wk initially; for dosage adjustments, see adult dosage

### Zidovudine-induced anemia in HIV-infected patients with circulating endogenous erythropoietin concentrations ≤500 mUnits/ml who are receiving a dose of zidovudine ≤4200 mg/wk

**Adult:** SUBCUT/IV initially, 100 units/kg 3×/wk. If Hgb does not increase after 8 wk, increase by 50-100 units/kg at 4 to 8 wk intervals until Hgb is at a concentration to avoid RBC transfusions or a dose of 300 units/kg is reached. If the Hgb >12 g/dl, withhold, once Hgb <11 g/dl resume at a dose 25% below the previous dose

### Anemia in patients with nonmyeloid malignancies where the anemia is due to the effect of concomitantly administered chemotherapy and at least 2 additional months of chemotherapy is planned

**Adult:** SUBCUT 150 units/kg three times weekly or 40,000 units once weekly only when the hemoglobin is <10 g/dl and only until the chemotherapy course is completed. Adjust the dose to maintain the lowest Hgb concentration sufficient to avoid RBC transfusions. If no rise in Hgb ≥1 g/dl after 4 wk of therapy and Hgb is <10 g/dl, the dosage may be increased to 300 units/kg subcut 3 times weekly or 60,000 units once wkly. Discontinue if after 8 wk of therapy there is no response as measured by Hgb rise of <1-2 g/dl concentrations or if transfusions are still required. Reduce the dose by approximately 25% if Hgb increases by more than 1 g/dl in any 2-week period or if Hgb reaches a concentration needed to avoid RBC infusion. If Hgb is increasing and exceeds a concentration necessary to avoid blood transfusions, hold therapy and reinstitute at a dose that is 25% lower when the Hgb reaches a concentration where transfusions may be needed

**Adolescent/child ≥5 yr:** IV 600 units/kg qwk only when the hemoglobin is <10 g/dl and only until the chemotherapy course is completed. Adjust the dose to maintain the lowest Hgb concentration sufficient to avoid RBC transfusions. If no rise in Hgb ≤1 g/dl after 4 wk of therapy and Hgb is <10 g/dl, the dosage may be increased to 900 units/kg (up to 60,000 units) IV weekly. Discontinue if after 8 wk there is no response as measured by Hgb concentrations or if transfusions are still required. Reduce the dose by approximately 25% if Hgb increases by more than 1 g/dl in any 2-wk period or if Hgb reaches a

concentration needed to avoid RBC infusion. If the Hgb is increasing and exceeds a concentration necessary to avoid blood transfusions, hold therapy and reinstitute at a dose that is 25% lower when the Hgb reaches a concentration where transfusions may be needed

**To reduce the need for allogenic blood transfusions in anemic patients (hemoglobin >10 and ≤13 g/dl) scheduled to undergo elective, noncardiac, nonvascular surgery**

**Adult:** Subcut 300 units/kg/day × 10 days before surgery, on the day of surgery, and for 4 days after surgery (15 days total) or 600 units/kg once weekly, 21, 14, and 7 days before surgery plus one dose on the day of surgery

**Available forms:** Inj 2000, 3000, 4000, 10,000, 20,000, 40,000 units/ml

### Implementation

- Do not use if discolored or particulates are present

**SUBCUT route**

- Before injecting, preservative-free, single-dose formulation may be admixed by using 0.9% NaCl, USP, with benzyl alcohol 0.9% at a 1:1 ratio to reduce injection site discomfort, store solution in refrigerator, protect from light

**Direct IV route**

- Administer by direct route at end of dialysis by venous line, do not shake vial
- If Hgb increases by 1 g/dl in 2 wk, decrease dose by 25%; increase dose if Hgb does not increase by 5-6 points after 8 wk of therapy; suggested target Hgb range 30%-36%
- Give additional heparin to lower chance of clots

**Solution compatibilities:** Do not dilute or administer with other solutions

## ADVERSE EFFECTS

**CNS:** Seizures, coldness, sweating, headache, fatigue, dizziness
**CV:** *Hypertension,* hypertensive encephalopathy, HF, edema, DVT, MI, stroke
**INTEG:** Pruritus, rash, inj site reaction
**MISC:** Iron deficiency
**MS:** Bone pain, arthralgia, myalgia
**RESP:** Cough

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (SUBCUT), completely absorbed (IV) |
| **Distribution** | Increased RBC count 2-6 wk |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 5-14 hr |

### Pharmacodynamics

| | SUBCUT/IV |
|---|---|
| **Onset** | Unknown |
| **Peak** | Immediate; SUBCUT: Peak 5-24 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Anticoagulants: need for increased heparin during hemodialysis

## NURSING CONSIDERATIONS

### Assessment

- Monitor renal studies: urinalysis, protein, blood, BUN, creatinine; I&O; report drop in output to <50 ml/hr

**BLACK BOX WARNING:** Monitor blood studies: ferritin, transferrin monthly, transferrin sat ≥20%; ferritin ≥100 ng/ml; Hct 2 ×/wk until stabilized in target range (30%-36%), then at regular intervals; those with endogenous erythropoietin levels of <500 units/L respond to this agent; check for symptoms of anemia: fatigue, pallor, dyspnea; monitor Hct 2 ×/wk in chronic renal failure; cancer patients and those being treated with zidovudine should be monitored weekly, then periodically after stabilization; death may occur in Hgb >12 g/dl

- Assess for CNS symptoms: coldness, sweating, pain in long bones
- Assess CV status: B/P before, during treatment; hypertension may occur rapidly, leading to hypertension encephalopathy; antihypertensives may be needed
- Assess patient during hemodialysis for bruits, thrills, or shunts; product prevents severe anemia in chronic renal failure; clotting may need to be treated with increased anticoagulant
- **Seizures:** place on seizure precautions; assess for seizures if Hct is increased within 2 wk by 4 points, increased B/P, more common in chronic renal failure in the first 90 days of treatment
- Monitor serum iron, ferritin, transferrin levels; iron therapy may be needed to prevent recurring anemia
- Monitor B/P, check for rising B/P as Hct rises
- Monitor blood studies: BUN, creatinine, uric acid, platelets, WBC, phosphorus, potassium, bleeding time; Hct, Hgb, RBCs, reticulocytes should be checked in chronic renal failure
- For hypersensitivity reactions: Skin rashes, urticaria (rare), antibody development does not occur

• For pure cell aplasia (PRCA) in absence of other causes, evaluate by testing serum for recombinant erythropoietin antibodies; any loss of response to epoetin should be evaluated
• Product should be used during pregnancy only when the benefits outweigh the risks of treatment. Multidose vials of epoetin are contraindicated due to the use of benzyl alcohol as a preservative; it is not known whether epoetin alfa is distributed into breast milk. Multidose vials of epoetin alfa are contraindicated in breastfeeding due to the use of benzyl alcohol as preservative Consider the benefits of breastfeeding, the risk of potential infant drug exposure, and the risk of an untreated or inadequately treated condition

### Patient/family education
• Teach patient how to take B/P
• Teach patient to report immediately chest pain, pain in calves, confusion, inability to speak, numbness in face, arms, legs
• Advise patients to take iron supplements, vit $B_{12}$, folic acid as directed
• Teach patient to avoid driving or hazardous activity during treatment
• Teach patients with renal disease to include high-iron and low-potassium foods in their diets (meat, dark green leafy vegetables, eggs, enriched breads)
• Teach patient the reason for treatment, expected results
• Advise patient to use contraception
• Chronic renal failure (anemia): Teach patient that product does not cure condition, to maintain prescribed diet, medications, dialysis follow-up appointments

### Evaluation
**Positive therapeutic outcome**
• Increased appetite
• Enhanced sense of well-being
• Increase in reticulocyte count in 2-6 wk, Hgb, Hct

**RARELY USED**

## eprosartan (Rx)
(ep-roh-sar'tan)
**Teveten**
*Func. class.:* Antihypertensive
*Chem. class.:* Angiotensin II receptor antagonist (Subtype $AT_1$)

**ACTION:** Blocks the vasoconstrictor and aldosterone-secreting effects of angiotensin II; selectively blocks the binding of angiotensin II to the $AT_1$ receptor found in tissues

**Therapeutic outcome:** Decreased B/P

**USES:** Hypertension, alone or in combination with other antihypertensives

## CONTRAINDICATIONS
Hypersensitivity

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Breastfeeding, children, geriatric, hypersensitivity to ACE inhibitors, renal/hepatic disease, angioedema, hyperkalemia

E

## DOSAGE AND ROUTES
**Adult:** PO 600 mg/day; dose may be divided and given bid, with total daily doses ranging from 400-800 mg, max 900 mg/day

### Renal dose
**Adult:** PO CCr ≤30 ml/min, max 600 mg/day

**Available forms:** Tabs 400, 600 mg

### Implementation
• May be given without regard to meals

## ADVERSE EFFECTS
**CNS:** *Dizziness*, depression, *fatigue,* headache
**CV:** Chest pain, palpitations
**EENT:** Sinusitis
**GI:** *Diarrhea, dyspepsia, abdominal pain*
**GU:** UTI
**HEMA:** Neutropenia
**INTEG:** Pruritus, angioedema
**META:** Hypertriglyceridemia
**MS:** *Myalgia,* arthralgia, rhabdomyolysis
**RESP:** *Cough, upper respiratory infection,* rhinitis, pharyngitis, viral infection
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Absolute bioavailability ~13%; food delays absorption |
| **Distribution** | Protein binding 98% |
| **Metabolism** | Moderate renal impairment increases product levels by 30%, hepatic impairment increases levels by 40% |
| **Excretion** | Urine, feces |
| **Half-life** | 5-9 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-2 hr |
| **Duration** | Unknown |

## INTERACTIONS
### Drug classifications
Antidiabetics: Increase: hyperglycemia
ACE inhibitors, angiotensin II receptor antagonists, potassium sparing diuretics, potassium supplements: increased hyperkalemia

NSAIDs, salicylates: decreased antihypertensive effect
Other antihypertensives: increased antihypertensive effect

### Drug/lab test

Increased: ALT, AST, alkaline phosphatase, potassium
Decreased: Hgb

## NURSING CONSIDERATIONS

### Assessment

- Assess B/P with position changes, pulse periodically; note rate, rhythm, quality
- Assess electrolytes: K, Na, Cl
- Assess baselines in renal, liver function tests before therapy begins
- **Heart failure:** Assess for edema, daily weight, rales/crackles, jugular vein distension, report significant findings
- Assess skin turgor, dryness of mucous membranes for hydration status
- **Hypersensitivity/anaphylaxis/angioedema:** Monitor for rash, dyspnea, throat tightness, if these occur, stop product, give antihistamine first, notify prescriber immediately
- **Pregnancy:** Identify if pregnancy is planned or suspected, if breastfeeding

### Patient/family education

- Advise patient to comply with dosage schedule, even if feeling better
- Advise patient to notify prescriber of fever, swelling of hands or feet, chest pain
- Inform patient that excessive perspiration, dehydration, diarrhea may lead to fall in blood pressure; consult prescriber if these occur, maintain adequate hydration
- Inform patient that product may cause dizziness; advise to avoid hazardous activities until effect is known, to rise slowly from sitting position
- Teach patient/family how to take B/P, report changes if significant

**BLACK BOX WARNING:** Advise patient not to take this medication if pregnant or breastfeeding, or if allergic reaction to this product has occurred

- Advise patient to take missed dose as soon as possible, unless within 1 hr of next dose

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P

**⚠ HIGH ALERT**

## eptifibatide (Rx)

(ep-tih-fib'ah-tide)
**Integrilin**
*Func. class.:* Antiplatelet agent
*Chem. class.:* Glycoprotein IIb/IIIa inhibitor

**ACTION:** Platelet glycoprotein antagonist; reversibly prevents fibrinogen, von Willebrand factor from binding to the glycoprotein IIb/IIIa receptor, inhibiting platelet aggregation

**Therapeutic outcome:** Decreased platelets

**USES:** Acute coronary syndrome, including those undergoing percutaneous coronary intervention (PCI)

## CONTRAINDICATIONS

Hypersensitivity, active internal bleeding, recent history of bleeding, stroke within 30 days or any hemorrhagic stroke, major surgery with severe trauma, severe hypertension, history of intracranial bleeding, current or planned use of another parenteral GPIIb/IIIa inhibitor, dependence on renal dialysis, coagulopathy, AV malformation, aneurysm

**Precautions:** Pregnancy, breastfeeding, children, geriatric, bleeding, renal function impairment

## DOSAGE AND ROUTES

### Acute coronary syndrome

**Adult: IV** BOL 180 mcg/kg as soon as diagnosed, max 22.6 mg; then **IV** CONT INF 2 mcg/kg/min × 72 hr or coronary artery bypass graft (CABG) discontinue ≥ 2-4 hr before procedure

### PCI in patients without acute coronary syndrome

**Adult: IV** BOL 180 mcg/kg given immediately before PCI; then 2 mcg/kg/min × 18 hr by CONT IV INF and a 2nd 180 mcg/kg BOL, 10 min after 1st BOL; continue INF for up to 18-24 hr at a rate of 1 mcg/kg/min

### Renal dose

**Adult:** IV BOL CCr <50 ml/min 2-4 mg/dl same loading dose, then ½ usual INF dose; CCr <10 ml/min contraindicated

**Available forms:** Sol for inj 2 mg/ml (10 ml), 0.75 mg/ml (100 ml)

### Implementation

- Aspirin may be given with this product; check for bleeding
- Discontinue heparin before removing femoral artery sheath after PCI

• Do not give discolored solutions, those with particulates; discard unused amount, protect from light
• Discontinue product prior to CABG

**Direct IV route**
• After withdrawing the BOL dose from 10-ml vial, give **IV** push over 1-2 min
• Do not use discolored sol or sol with particulate

**Continuous IV infusion route**
• Follow BOL dose with cont inf using infusion pump, give product undiluted directly from the 100-ml vial, spike the 100-ml vial with a vented infusion set; use caution when centering the spike on the circle of the stopper top, refrigerate vials, store vials ≤2 months at room temperature

**Y-site compatibilities:** Alfentanil, alteplase, amikacin, aminophylline, amphotericin B lipid complex, amphotericin B liposome, ampicillin, ampicillin-sulbactam, anidulafungin, argatroban, atenolol, atracurium, atropine, azithromycin, aztreonam, bivalirudin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, ceFAZolin, cefepime, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, cimetidine, ciprofloxacin, cisatracurium, clindamycin, cycloSPORINE, DAPTOmycin, dexamethasone, $D_5$/NaCl 0.9%, diazepam, diltiazem, diphenhydrAMINE, DOBUTamine, dolasetron, DOPamine, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, ertapenem, erythromycin, esmolol, famotidine, fentaNYL, fluconazole, fosphenytoin, ganciclovir, gatifloxacin, gentamicin, granisetron, haloperidol, heparin, hydrocortisone, HYDROmorphone, hydrOXYzine, imipenem-cilastatin, inamrinone, isoproterenol, ketorolac, labetalol, leucovorin, levofloxacin, levorphanol, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, meperidine, meropenem, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, micafungin, midazolam, milrinone, minocycline, mivacurium, morphine, nalbuphine, naloxone, niCARdipine, nitroglycerin, nitroprusside, NS, octreotide, ofloxacin, ondansetron, oxytocin, palonosetron, pancuronium, PEMEtrexed, PENTobarbital, PHENobarbital, phenylephrine, piperacillin, piperacillin-tazobactam, potassium chloride/phosphates, procainamide, prochlorperazine, promethazine, propranolol, ranitidine, remifentanil, rocuronium, sodium bicarbonate/phosphates, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, teniposide, theophylline, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, trimethobenzamide, vancomycin, vecuronium, verapamil, zidovudine, zoledronic acid

**Solution compatibilities:** 0.9% NaCl, $D_5$/0.9% NaCl
• Discontinue product before CABG
• Give all medications PO if possible, avoid IM inj and catheters

## ADVERSE EFFECTS

**CV:** Stroke, hypotension
**GU:** Hematuria
**HEMA:** Thrombocytopenia, platelet dysfunction
**SYST:** Major/minor bleeding from any site, anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 25% |
| **Metabolism** | Limited |
| **Excretion** | Kidneys |
| **Half-life** | 1.5-2 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Within 1 hr |

## INTERACTIONS

### Individual drugs

Abciximab, aspirin, clopidogrel, dipyridamole, heparin, ticlopidine, valproate: increased bleeding

### Drug classifications

Anticoagulants, NSAIDs, SSRIs, SNRIs, thrombolytics: increased bleeding
Platelet receptor inhibitors IIb, IIIa: do not give together

### Drug/herb

Feverfew, garlic, ginger, ginkgo, ginseng

## NURSING CONSIDERATIONS

### Assessment

• **Thrombocytopenia:** Monitor platelets, Hgb, Hct, creatinine, APTT baseline, INR, within 6 hr of loading dose and daily thereafter; patients undergoing PCI should have ACT monitored; maintain APTT 50-70 sec unless PCI is to be performed; during PCI, ACT should be 200-300 sec; if platelets drop <100,000/mm³, obtain additional platelet counts; if thrombocytopenia is confirmed, discontinue product; also draw Hct, Hgb, serum creatinine
• **Pregnancy/breastfeeding:** Use in pregnancy only if clearly needed, it is not known if product is excreted in breast milk, consider risks and benefits

• **Assess for bleeding:** gums, bruising, ecchymosis, petechiae; from GI, GU tract, cardiac catheter sites, IM inj sites

### Patient/family education

• Teach patient to report bruising, bleeding, chest pain immediately
• Teach patient not to use other Rx, OTC, supplements without prescriber approval
• Inform patient of reason for medication and expected results

### Evaluation

**Positive therapeutic outcome**
• Decreased platelets

## ergocalciferol

*See vitamin D*

**⚠ HIGH ALERT**

## eribulin (Rx)

(er'i-bue'lin)
**Halaven**
*Func. class.:* Antineoplastics
*Chem class.:* Microtubule inhibitor

**Do not confuse:** eribulin/epirubicin/erlotinib

**ACTION:** Potent antimitotic agent, different from taxes, vinca alkaloids, epothilones; blocks cell progression in $G_2$-M phase, inhibits the growth phase of microtubules and sequesters tubules, leading to disruption of mitotic spindles and apoptotic cell death

**Therapeutic outcome:** Decreased spread and size of tumor

**USES:** Metastatic breast cancer patients who have received at least 2 chemotherapy regimens

### CONTRAINDICATIONS

Hypersensitivity, pregnancy

**Precautions:** Bradycardia, breastfeeding, children, electrolyte imbalances, heart failure, hepatic disease, hypokalemia, hypomagnesemia, infants, infertility, neonates, neutropenia, peripheral neuropathy, QT prolongation, renal disease

### DOSAGE AND ROUTES

**Adult: IV** 1.4 mg/m² over 2-5 min on days 1 and 8, repeat q21days

### Recommendations for dose delay

• **For ANC< 1000/mm³, platelets< 75,000/mm³, or grade 3 or 4 nonhematologic toxicities:** Do not administer; the day 8 dose may be delayed a maximum of 1 wk
• **For the day 8 dose, if toxicities do not resolve to ≤grade 2 by day 15:** Omit the dose
• **For the day 8 dose, if toxicities resolve or improve to ≤grade 2 by day 15:** Administer eribulin at a reduced dose (see below) and initiate the next cycle no sooner than 2 wk later

### Dosage adjustments for hematologic toxicity

• **ANC <500/mm³ for >7 days or ANC <1000/mm³ with fever or infection:** Permanently reduce dosage to 1.1 mg/m²
• **Platelets <25,000/mm³ or <50,000/mm³ requiring transfusion:** Permanently reduce dosage to 1.1 mg/m²
• **If day 8 of previous cycle omitted or delayed:** Permanently reduce dosage to 1.1 mg/m²
• **While receiving 1.1 mg/m², if recurrence of hematologic event occurs, or if day 8 of previous cycle omitted or delayed:** Permanently reduce dosage to 0.7 mg/m²
• **While receiving 0.7 mg/m², if recurrence of hematologic event occurs, or if day 8 of previous cycle omitted or delayed:** Discontinue

### Dose adjustments of eribulin for nonhematologic toxicity during treatment

• **Any grade 3 or 4 nonhematologic toxicity:** Permanently reduce dosage to 1.1 mg/m²
• **If day 8 of previous cycle omitted or delayed:** Permanently reduce dosage to 1.1 mg/m²
• **While receiving 1.1 mg/m², if recurrence of grade 3 or 4 nonhematologic toxicity occurs, or if day 8 of previous cycle omitted or delayed:** Permanently reduce dosage to 0.7 mg/m²
• **While receiving 0.7 mg/m², if recurrence of grade 3 or 4 nonhematologic toxicity occurs, or if day 8 of previous cycle omitted or delayed:** Discontinue

**Available forms:** Solution for injection 1 mg/2 ml

### Implementation

**IV direct, intermittent route**
• Visually inspect for particulate matter or discoloration as solution and container permit; withdraw required amount (0.5 mg/ml) from single-use vial, give undiluted over 2-5 min or diluted in 100 ml 0.9% NaCl and give as intermittent infusion, do not give through line with dextrose or any other product
• Store at room temperature for 4 hr or 24 hr refrigerated

## ADVERSE EFFECTS

**CNS:** Depression, dizziness, *fatigue,* fever, headache, insomnia, *peripheral neuropathy*
**CV:** QT prolongation, peripheral edema
**GI:** Abdominal pain, anorexia, constipation, diarrhea, dyspepsia, nausea, vomiting, weight loss
**HEMA:** Anemia, neutropenia, thrombocytopenia
**INTEG:** *Alopecia,* rash, stomatitis, infusion-related reactions
**META:** Hypokalemia
**MS:** Arthralgia, myalgia, bone/back pain
**RESP:** Cough, dyspnea
**SYST:** Infection

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Protein binding, 49%-65% |
| **Distribution** | Unknown |
| **Metabolism** | Inhibits CYP3A4 |
| **Excretion** | Feces 82%, urine 9% |
| **Half-life** | 40 hr, increased levels in renal/hepatic disease |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Arsenic trioxide, bepridil, chloroquine, clarithromycin, dextromethorphan, dronedarone, droperidol, erythromycin, halofantrine, haloperidol, levomethadyl, methadone, pentamidine, pimozide, posaconazole, probucol, propafenone, quiNIDine, saquinavir, sparfloxacin, troleandomycin, and ziprasidone; also to a lesser degree abarelix, alfuzosin, amoxapine, apomorphine, artemether; lumefantrine, asenapine, ofloxacin, cloZAPine, cyclobenzaprine, dasatinib, dolasetron, flecainide, gatifloxacin, gemifloxacin, iloperidone, lapatinib, levofloxacin, lopinavir; ritonavir, magnesium sulfate; potassium sulfate; sodium sulfate, maprotiline, mefloquine, moxifloxacin, nilotinib, norfloxacin, octreotide, ciprofloxacin, OLANZapine, ondansetron, paliperidone, palonosetron, QUEtiapine, ranolazine, risperiDONE, sertindole, SUNItinib, tacrolimus, telavancin, telithromycin, tetrabenazine, venlafaxine, vardenafil, vorinostat: increased QT prolongation

Live virus vaccines, do not use together
Increase: Adverse reactions

### Drug classifications

Certain phenothiazines (chlorproMAZINE, mesoridazine, thioridazine), class IA antiarrhythmics (disopyramide, procainamide, quiNIDine), class III antiarrhythmics (amiodarone, bretylium, dofetilide, ibutilide, sotalol), also to a lesser degree, beta-agonists, halogenated anesthetics, local anesthetics, some phenothiazines (fluPHENAZine, perphenazine, prochlorperazine, trifluoperazine), tricyclic antidepressants: increased QT prolongation

## NURSING CONSIDERATIONS

### Assessment

- Peripheral neuropathy: assess for pain, numbness in extremities
- Infection: assess for increased temperature, sore throat, flulike symptoms
- **QT prolongation:** assess for drug interactions that may occur; monitor ECG, heart rate
- **Bone marrow depression:** CBC and differential, serum creatinine/bun/electrolytes, liver function tests, baseline and periodically, increased AST/ALT $>3 \times$ ULN or total bilirubin $>1.5 \times$ ULN are at a greater chance of grade 4 or febrile neutropenia

### Dosage adjustments for treatment-related toxicities

- **Dermatologic: Severe rash, not responsive to medical management: Hold;** when rash resolves to baseline or grade 0 or 1 (generally less than 10% BSA), resume therapy at a reduced dose (by 50-mg decrements); **Severe bullous, blistering, or exfoliating skin condition:** Discontinue
- **Gastrointestinal: Persistent severe diarrhea not responsive to medical management (e.g., loperamide):** Hold; when diarrhea resolves to baseline or grade 0 or 1 (fewer than four stools/day over baseline; mild increase in ostomy output compared with baseline), resume therapy at a reduced dose (by 50-mg decrements); **GI perforation:** Permanently discontinue
- **Ocular; grade 3 or 4 keratitis (decline in vision, worse than 20/40; limiting self-care ADL; perforation or blindness) or grade 2 keratitis (symptomatic; topical agents indicated; limiting instrumental ADL) lasting more than 2 wk:** Hold; when keratitis resolves to baseline or grade 0 or 1

(asymptomatic; not limiting ADL), resume at a reduced dose (by 50-mg decrements); **acute/worsening ocular disorders (e.g., eye pain):** Hold and consider discontinuation or, when ocular disorder resolves to baseline or grade 0 or 1, resume at a reduced dose (by 50-mg decrements); **corneal perforation or severe ulceration:** Discontinue
• **Pneumonitis/interstitial lung disease (ILD); Acute onset of new or progressive pulmonary symptoms (e.g., dyspnea, cough, or fever):** Hold until diagnostic evaluation; permanently discontinue and institute appropriate treatment if ILD is confirmed

### Patient/family education

• **Infection:** teach patient to notify prescriber of increased temperature, sore throat, fatigue, flu-like symptoms
• **QT prolongation:** teach patient to report extra heartbeats
• Peripheral neuropathy: teach patient to report tingling, pain in extremities
• Teach patient reason for product and expected results
• Advise patient to report side effects to health care provider
• Advise patient to avoid other medications, supplements unless approved by provider, serious drug interactions may occur
• Discuss hair loss and use of wig or hairpiece
• Advise patient to notify prescriber if pregnancy is planned or suspected to use contraception during treatment, avoid breastfeeding

### Evaluation

**Positive therapeutic outcome**
• Decreasing tumor spread and size

**⚠ HIGH ALERT**

## erlotinib (Rx)

(er-loe'tye-nib)
**Tarceva**
*Func. class.:* Misc. antineoplastic
*Chem. class.:* Epidermal growth factor receptor inhibitor

**ACTION:** Not fully understood. Inhibits intracellular phosphorylation of cell surface receptors associated with epidermal growth factor receptors.

**Therapeutic outcome:** Decrease in tumor size

**USES:** Non–small cell lung cancer (NSCLC), maintenance, after failure of at least one chemotherapy regimen including EGFR exon 19 deletions or exon 21 substitution mutations, pancreatic cancer

## CONTRAINDICATIONS

Pregnancy, breastfeeding

**Precautions:** Renal, hepatic; ocular, pulmonary disorders; children; geriatric, diverticulitis

## DOSAGE AND ROUTES

### Non–small cell lung cancer (NSCLC)

**Adult:** PO 150 mg/day

### Pancreatic cancer

**Adult:** PO 100 mg/day in combination with gemcitabine 1000 mg/m$^2$ cycle 1, days 1, 8, 15, 22, 29, 36, 43 of an 8-wk cycle; cycle 2 and subsequent cycles, days 1, 8, 15 of a 4-wk cycle, used with gemcitabine

### CYP3A4 inducers concurrently (such as rifampin or phenytoin)

Dosage increase is advised

### CYP3A4 inhibitors (atazanavir, clarithromycin, indinavir, itraconazole, ketoconazole, telithromycin, ritonavir, saquinavir, troleandomycin, nelfinavir)

Dosage reduction may be needed

### Hepatic dose

**Baseline hepatic impairment: Adult PO** ***Child-Pugh A, B, and C; total bilirubin above upper limit of normal (ULN):*** Closely monitor for adverse events, as erlotinib undergoes significant liver metabolism; use increased monitoring in those with total bilirubin more than 3 times ULN

**Treatment-related hepatotoxicity:** ***Total bilirubin more than 3 times ULN or AST/ALT more than 5 times ULN in patients without baseline hepatic impairment:*** Hold; resume at a reduced dose (by 50-mg decrements) when liver function tests resolve to baseline or grade 0 or 1 (bilirubin less than or equal to 1.5 times ULN or AST/ALT less than or equal to 3 times ULN). Discontinue if resolution or significant improvement does not occur within 3 wk. ***Total bilirubin 2 times baseline or AST/ALT 3 times baseline in patients with preexisting hepatic impairment or biliary obstruction:*** Hold, resume at a reduced dose (by 50-mg decrements) when liver function tests resolve to baseline or grade 0 or 1 (bilirubin ≤ 1.5 X ULN, or AST/ALT ≤ 3 times ULN). Discontinue if resolution or significant improvement does not occur within 3 wk

### Renal dose

**Adult: PO treatment-induced nephrotoxicity:** ***Grade 3 or 4 renal impairment (serum creatinine (CCr) >3 times baseline or >3 to***

***6 times ULN:*** Hold, when resolved to grade 0 or 1 (CCr ≤ 1.5 times either baseline or ULN), resume at a reduced dose (by 50-mg decrements) or discontinue

**Available forms:** Tabs 25, 100, 150 mg

### Implementation
- Administer 1 hr before or 2 hr after food

## ADVERSE EFFECTS
**CNS:** CVA, anxiety, depression, headache, rigors, insomnia
**CV:** MI/ischemia
**EENT:** Ocular changes, *conjunctivitis, eye pain,* hypertrichosis
**GI:** *Nausea, diarrhea, vomiting, anorexia, mouth ulceration,* hepatic failure, GI perforation
**GU:** Renal impairment/failure
**HEMA:** DVT, bleeding
**INTEG:** *Rash,* Stevens-Johnson–like skin reactions, toxic epidermal necrolysis
**MISC:** *Fatigue, infection*
**RESP:** Interstitial lung disease, *cough, dyspnea,* ARDS, pulmonary fibrosis
**SYST:** Hepatorenal syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Slowly absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Metabolized by CYP3A4 (Gen), inhibits tyrosine kinase, which is a factor in epidermal growth factor receptor (EGFR) |
| **Excretion** | Feces (86%), urine (<4%) |
| **Half-life** | 36 hr elimination |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 3-7 hr |
| **Duration** | Unknown |

## INTERACTIONS
### Individual drugs
Metoprolol, warfarin: increased plasma concentrations
Smoking: decreased erlotinib level, dose may need to be increased

### Drug classifications
CYP3A4 inducers (phenytoin, rifampin, carBAMazepine, phenobarbital), proton-pump inhibitors: decreased erlotinib levels
CYP3A4 inhibitors (clarithromycin, erythromycin, itraconazole, ketoconazole, telithromycin): increased erlotinib concentrations
HMG-CoA reductase inhibitors: increased myopathy
NSAIDs: GI bleeding may be fatal

### Drug/herb
St. John's wort: decreased erlotinib levels

### Drug/food
Grapefruit juice: increased effect of erlotinib

### Drug/labs
Increase: INR, PT, AST, ALT, bilirubin

## NURSING CONSIDERATIONS
### Assessment
- **Serious skin toxicities:** toxic epidermal necrolysis, Stevens-Johnson syndrome, check for rash, blistering, discontinue treatment, may need corticosteroid
- **Pregnancy/breastfeeding:** Patient should not become pregnant during treatment or for 1 mo after last dose, do not breastfeed during or for 2 wk after final dose
- Assess for MI/ischemia, CVA in pancreatic cancer
- **Assess for pulmonary changes:** lung sounds, cough, dyspnea; interstitial lung disease may occur, may be fatal; discontinue therapy if confirmed
- **Assess for ocular changes:** eye irritation, corneal erosion/ulcer, aberrant eyelash growth
- Assess for GI symptoms: frequency of stools; if diarrhea is poorly tolerated, therapy may be discontinued for up to 14 days; monitor for dehydration, fluid status during period of vomiting and diarrhea
- Monitor blood studies: INR, LFTs, PT
- **Hepatic failure:** interrupt dosing if severe changes to liver function occur (total bilirubin >3× ULN and/or transaminases >5× ULN for normal pretreatment LFTs)
- **GI perforation/bleeding:** some cases have been fatal, usually occurs in those using NSAIDs, taxanes, or those with diverticulitis or peptic ulcer disease, discontinue if these occur

### Patient/family education
- **Teach patient to report adverse reactions immediately:** SOB, severe abdominal pain, persistent diarrhea or vomiting, ocular changes, skin eruptions (face, upper chest, back pain)
- Explain reason for treatment, expected results, to take on empty stomach 1 hr before or 2 hr after meals
- Advise patient to use contraception during treatment; pregnancy, avoid breastfeeding

• Instruct patient to avoid use with other products, herbs, or supplements unless approved by provider
• Instruct patient to avoid smoking; decreases effect of this product

### Evaluation

**Positive therapeutic outcome**
• Decrease non–small cell lung cancer cells

## ertapenem (Rx)

(er-tah-pen′em)
**INVanz**
*Func. class.:* Antiinfective, miscellaneous
*Chem. class.:* Carbapenem

**Do not confuse:** INVanz/Aninza

**ACTION:** Interferes with cell wall replication of susceptible organisms

**Therapeutic outcome:** Bactericidal action against the following organisms: *Bacteroides fragilis, Bacteroides distasonis, Bacteroides ovatus, Bacteroides thetaiotaomicron, Bacteroides uniformis; Clostridium clostridioforme, Escherichia coli, Eubacterium lentum, Haemophilus influenzae* (β lactamase–negative), *Klebsiella pneumoniae, Moraxella catarrhalis, Peptostreptococcus* sp., *Porphyromonas asaccharolytica, Prevotella bivia, Staphylococcus aureus* (methicillin-susceptible); *Streptococcus agalactiae, Streptococcus pneumoniae* (penicillin-susceptible), *Streptococcus pyogenes*

**USES:** Bacteremia, *Bacteroides distasonis, Bacteroides fragilis, Bacteroides ovatus, Bacteroides thetaiotaomicron, Bacteroides uniformis, Bacteroides vulgatus, Citrobacter freundii, Citrobacter koseri, Clostridium clostridioforme, Clostridium perfringens,* community-acquired pneumonia, diabetic foot ulcer, endomyometritis, *Enterobacter aerogenes, Enterobacter cloacae, Escherichia coli, Eubacterium lentum, Fusobacterium, Haemophilus influenzae* (beta-lactamase negative), *Haemophilus influenzae* (beta-lactamase positive), *Haemophilus parainfluenzae, intraabdominal infections, Klebsiella oxytoca, Klebsiella pneumoniae, Moraxella catarrhalis, Morganella morganii, Peptostreptococcus, Porphyromonas asaccharolytica, Prevotella bivia, Proteus mirabilis, Proteus vulgaris, Providencia rettgeri, Providencia stuartii, Serratia marcescens,* skin infections, *Staphylococcus aureus* (MSSA), *Staphylococcus epidermidis, Streptococcus agalactiae* (group B streptococci), *Streptococcus pneumoniae, Streptococcus pyogenes* (group A beta-hemolytic streptococci), surgical infection prophylaxis, urinary tract infections

## CONTRAINDICATIONS

Hypersensitivity to this product or its components, to amide-type local anesthetics (IM only); anaphylactic reactions to β-lactams, other carbapenems

**Precautions:** Pregnancy, breastfeeding, children, geriatric, renal/hepatic/GI disease, seizures

## DOSAGE AND ROUTES

### Complicated intraabdominal infections

**Adult:** IM/**IV** 1 g/day × 5-14 days
**Child 3 mo-12 yr:** IM/**IV** 15 mg/kg bid (max 1 g/day) × 5-14 days

### Complicated skin/skin structure infections

**Adult/adolescent:** IM/**IV** 1 g/day × 7-14 days
**Child 3 mo-12 yr:** IM/**IV** 15 mg/kg bid × 7-14 days

### Community-acquired pneumonia

**Adult/adolescent:** IM/**IV** 1 g/day × 10-14 days
**Child 3 mo-12 yr:** IM/**IV** 15 mg/kg bid × 10-14 days, max 1 g/day

### Complicated UTI

**Adult/adolescent:** IM/**IV** 1 g/day × 10-14 days
**Child 3 mo-12 yr:** IM/**IV** 15 mg/kg bid × 10-14 days

### Acute pelvic infections

**Adult/adolescent:** IM/**IV** 1 g/day × 3-10 days
**Child 3 mo-12 yr:** IM/**IV** 15 mg/kg bid × 3-10 days

### Surgical infection prophylaxis

**Adult:** **IV** 1 g as a single dose 1 hr prior to surgical incision

### Renal dose

**Adult:** IM/IV CCr ≤30 ml/min, 500 mg/day

**Available forms:** Powder, lyophilized, 1 g

### Implementation

**IV route**
• Visually inspect for particulate matter and discoloration before use: may be colorless to pale yellow; do not mix with other products; dextrose solutions are not compatible
• 1 g vial: For each gram reconstitute with 10 ml of either NS injection, sterile water for injection, or bacteriostatic water for injection to 100 mg/ml, shake
• 1 g dose: immediately transfer contents of the reconstituted vial to 50 ml of NS injection; for a dose <1 g (pediatric patients 3 mo to

12 yr): from the reconstituted vial, immediately withdraw a volume equal to 15 mg/kg of body weight (max 1 g/day) and dilute in NS injection to a concentration of 20 mg/ml or less

**IV infusion route**

- Complete the infusion within 6 hr of reconstitution, infuse over 30 min; do not co-infuse with other medications
- The reconstituted IV solution may be stored at room temperature if used within 6 hr, or stored under refrigeration for 24 hr and used within 4 hr after removal from refrigeration; do not freeze

**IM route**

- Reconstitute the 1 g vial of ertapenem with 3.2 ml of 1% lidocaine HCl injection (without EPINEPHrine) (280 mg/ml), agitate well to form a solution; the IM reconstituted formulation is not for IV use
- IM administration may be used as an alternative to IV administration in the treatment of infections where IM therapy is appropriate; only given via IM injection × 7 days
- For a 1 g dose: immediately withdraw the contents of the vial and inject deeply into a large muscle, aspirate prior to injection to avoid injection into a blood vessel
- For a dose <1 g (i.e., for pediatric patients 3 mo to 12 yr): immediately withdraw a volume equal to 15 mg/kg (max 1 g/day) and inject deeply into a large muscle, aspirate prior to injection to avoid injection into a blood vessel; use the reconstituted IM solution within 1 hour after preparation

**Y-site compatibilities:** Acyclovir, alfentanil, amifostine, amikacin, aminocaproic acid, aminophylline, amphotericin B lipid complex, amphotericin B liposome, argatroban, arsenic trioxide, atenolol, atracurium, azithromycin, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, busulfan, butorphanol, calcium chloride/gluconate, CARBOplatin, carmustine, chloramphenicol, cimetidine, ciprofloxacin, cisatracurium, CISplatin, cyclophosphamide, cycloSPORINE, cytarabine, dacarbazine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, dexrazoxane, digoxin, diltiazem, diphenhydrAMINE, DOCEtaxel, dolasetron, DOPamine, doxacurium, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, eptifibatide, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fluconazole, fludarabine, fluorouracil, foscarnet, fosphenytoin, furosemide, ganciclovir, gatifloxacin, gemcitabine, gemtuzumab, gentamicin, glycopyrrolate, granisetron, haloperidol, heparin, hydrocortisone, HYDROmorphone, ifosfamide, inamrinone, insulin (regular), irinotecan, isoproterenol, ketorolac, labetalol, lepirudin, leucovorin, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, mesna, metaraminol, methotrexate, methyldopate, methylPREDNISolone, metoclopramide, metroNIDAZOLE, milrinone, mitoMYcin, mivacurium, morphine, moxifloxacin, nalbuphine, naloxone, nesiritide, nitroglycerin, nitroprusside, norepinephrine, octreotide, oxaliplatin, oxytocin, PACLitaxel, pamidronate, pancuronium, pantoprazole, PEMEtrexed, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, polymixin B, potassium acetate/chloride/phosphates, procainamide, propranolol, ranitidine, remifentanil, rocuronium, sodium acetate/bicarbonate/phosphates, streptozocin, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, tacrolimus, telavancin, teniposide, theophylline, thiotepa, tigecycline, tirofiban, tobramycin, trimethobenzamide, vancomycin, vasopressin, vecuronium, vinBLASTine, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CNS:** Insomnia, seizures, dizziness, *headache,* agitation, confusion, somnolence, disorientation, edema, hypotension

**CV:** Tachycardia, seizures

**GI:** *Diarrhea, nausea, vomiting,* pseudomembranous colitis, cholelithiasis, jaundice, abdominal pain

**GU:** *Vaginitis,* dysuria

**INTEG:** *Rash,* urticaria, *pruritus,* pain at inj site, *infused vein complication, phlebitis/thrombophlebitis*, erythema at inj site, dermatitis

**RESP:** Dyspnea, cough, pharyngitis, crackles, respiratory distress

**SYST:** Anaphylaxis, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Almost completely absorbed (IM); completely absorbed (**IV**) |
| **Distribution** | 85%-95% plasma protein bound |
| **Metabolism** | Liver (IM, **IV**) |
| **Excretion** | Urine (80%), feces (10%), breast milk (IM, **IV**) |
| **Half-life** | 4 hr (**IV**) |

### Pharmacodynamics

| | IM | IV |
|---|---|---|
| **Onset** | Unknown | Immediate |
| **Peak** | 2.3 hr | Dose-dependent |
| **Duration** | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Probenecid: increased ertapenem plasma levels; do not coadminister
Valproic acid: decreased effect of valproic acid, monitor valproic levels, seizure control
Warfarin: Increase: INR

### Drug/lab test

Increased: hepatic enzymes, albumin, alkaline phosphatase, bilirubin, creatinine, PT
Decrease: Hct, WBC

## NURSING CONSIDERATIONS

### Assessment

- Assess for renal disease: lower dose may be required
- **Pseudomembranous colitis:** Assess bowel pattern daily: if severe diarrhea occurs, product should be discontinued
- **Assess for infection:** temp, sputum, characteristics of wound before, during, after treatment
- **Pregnancy/breastfeeding:** Use only when clearly needed, use caution in breastfeeding
- **Assess for allergic reactions, anaphylaxis:** rash, urticaria, pruritus may occur a few days after therapy begins; assess for sensitivity to carbapenem antibiotics, other β-lactam antibiotics, penicillins, have emergency equipment, epinephrine close by
- **Assess for overgrowth of infection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough or sputum

### Patient/family education

- Advise patient to report severe diarrhea; may indicate pseudomembranous colitis
- **Advise patient to report overgrowth of infection:** black, furry tongue, vaginal itching, foul-smelling stools
- Caution patient to avoid breastfeeding; product is excreted in breast milk

### Evaluation

**Positive therapeutic outcome**

- Negative C&S, absence of signs and symptoms of infection

## TREATMENT OF OVERDOSE:

Administer EPINEPHrine, antihistamines; resuscitate if needed (anaphylaxis)

**ERYTHROMYCIN**

**erythromycin base (Rx)**
(eh-rith-roh-my′sin)
**Apo Erythro, Ery-Tab, Novo-Rythro Encap, PCE**
**erythromycin ethylsuccinate (Rx)**
**Apo-Erythro-ES, EES, Erythro-ES, Ery Ped, Novo-Rythro**
**erythromycin lactobionate (Rx)**
**Erythrocin**
**erythromycin stearate (Rx)**
**Apo-Erythro-S, Erythrocin, My-E, Novo-Rythro**
*Func. class.:* Antiinfective
*Chem. class.:* Macrolide

**Do not confuse:** erythromycin/azithromycin

**ACTION:** Binds to 50S ribosomal subunits of susceptible bacteria and suppresses protein synthesis

**Therapeutic outcome:** Bactericidal action against the following organisms: *Neisseria gonorrhoeae, Streptococcus pneumoniae, Mycoplasma pneumoniae, Corynebacterium diphtheriae, Bordetella pertussis, Borrelia burgdorferi, Listeria monocytogenes, Treponema pallidum;* streptococci, staphylococi; gram-negative pathogens: *Neisseria, Haemophilus influenzae* (when used with sulfonamides), *Legionella pneumophila, Chlamydia trachomatis*

**USES:** Mild to moderate respiratory tract, skin, soft tissue infections, Legionnaire's disease, syphilis

## CONTRAINDICATIONS

Hypersensitivity, preexisting liver disease (estolate)

**Precautions:** Pregnancy, breastfeeding, geriatric, hepatic/GI disease, QT prolongation, seizure disorder, myasthenia gravis

## DOSAGE AND ROUTES

### Acne vulgaris

**Adult:** PO 250 mg qid

**Mild to moderately severe upper respiratory tract infections (otitis media, sinusitis) or lower respiratory tract infections (pneumonia,**

### bronchitis) caused by susceptible organisms

**Adult:** PO 250-500 mg (of base, estolate or stearate) q6hr or 400-800 mg (ethylsuccinate) q6hr; IV 15-20 mg/kg/day in divided doses q4-6 hr, max 4 g/day

**Adolescent/child/infant:** PO 20-50 mg/kg/day divided q6hr, max adult doses; IV 15-20 mg/kg/day in divided doses q4-6hr, or as a continuous infusion, max dose 4 g/day

**Neonate >7 days, weighing ≥1200 g:** PO 30 mg/kg/day in divided doses q8hr

**Neonate >7 days, weighing <1200 g:** PO 20 mg/kg/day in divided doses q12hr

**Neonate ≤7 days:** PO 20 mg/kg/day PO in divided doses q12hr

### Pneumonia caused by *Chlamydia trachomatis* in infants and neonates

**Infant/neonate:** PO; the CDC recommends 50 mg/kg/day in four divided doses × 14 days (erythromycin base or ethylsuccinate)

### *Mycoplasma* infection such as *Mycoplasma pneumoniae* pneumonia

**Adult:** PO 250-500 mg tid

**Adult/adolescent/child/infant:** IV 15-20 mg/kg/day, given in divided doses q4-6hr, or as a continuous infusion, maximum dose 4 g/day; replace by oral dosage as soon as possible

### Legionnaire's disease (caused by *Legionella pneumophila*)

**Adult:** PO/IV 0.5-1 g q6hr × 21 days

### Treatment of group A beta-hemolytic streptococcal (GAS) pharyngitis (primary rheumatic fever prophylaxis)

**Adult:** PO 250-500 mg (base, estolate, or stearate) q6hr or 400-800 mg (ethylsuccinate) q6hr × 10 days

**Adolescent/child/infant:** PO 20-50 mg/kg/day, divided q6hr × 10 days, max adult dose

### Secondary prevention of rheumatic fever (prevention of recurrent attacks of rheumatic fever)

**Adult/adolescent/child:** PO 250 mg bid in patients allergic to penicillin and sulfADIAZINE for 10 yr or age 40 yr, whichever is longer, secondary prophylaxis (American Heart Association)

### Listeriosis

**Adult:** PO 250-500 mg (base, estolate or stearate) q6hr or 400-800 mg (ethylsuccinate) q6hr

**Adolescent/child/infant:** PO 20-50 mg/kg/day PO, divided q6hr, max adult doses

### Cervicitis caused by *Chlamydia trachomatis*

**Adult/adolescent:** PO; the CDC recommends erythromycin base 500 mg qid or erythromycin ethylsuccinate 800 mg qid × 7 days as alternatives to first-line agents doxycycline or azithromycin

**Pregnant female:** As alternatives to first-line agents azithromycin or amoxicillin, the CDC recommends PO base 500 mg qid × 7 days, base 250 mg qid × 14 days, ethylsuccinate 800 mg qid × 7 days, ethylsuccinate PO 400 mg qid × 14 days

**Child ≤45 kg:** The CDC recommends base or ethylsuccinate PO 50 mg/kg/day in 4 doses × 14 days

### Proctitis caused by *Chlamydia trachomatis*

**Adult/adolescent:** PO base 500 mg qid

### Chlamydial conjunctivitis caused by *Chlamydia trachomatis* including trachoma and inclusion conjunctivitis

**Pregnant and lactating woman/child <8 yr:** PO 250-500 mg qid × 10-14 days

### Infant pneumonia caused by *Chlamydia trachomatis*

**Infant/neonate:** PO (base or ethylsuccinate); the CDC recommends 50 mg/kg/day 4 divided doses × 14 days

### Nongonococcal urethritis (NGU) caused by *Chlamydia trachomatis* or *Ureaplasma urealyticum*

**Adult/adolescent:** PO; the CDC recommends 500 mg (base) qid or 800 mg (ethylsuccinate) qid × 7 days as alternatives to first-line agents doxycycline or azithromycin

**Pregnant female:** PO; the CDC recommends base 500 mg qid × 7 days

**Child <45 kg:** PO; the CDC recommends base 50 mg/kg/day in 4 divided doses × 10-14 days, second course of therapy may be required

### Ophthalmia neonatorum caused by *Chlamydia trachomatis*

**Neonate:** PO (erythromycin base or ethylsuccinate); the CDC recommends 50 mg/kg/day in qid × 14 days, may be repeated if condition returns

### Lymphogranuloma venereum caused by *Chlamydia trachomatis*

**Adult:** PO (base); the CDC recommends 500 mg qid × 21 days as an alternative to doxycycline

### Adjunctive treatment of diphtheria to prevent establishment of carrier state and to eradicate *Corynebacterium diphtheriae* in carriers

**Adult:** PO 500 mg q6hr × 10 days

### Intestinal amebiasis (unable to take metroNIDAZOLE)

**Adult:** PO 250 mg q6hr × 10-14 days
**Adolescent/child:** PO 30-50 mg/kg/day, divided q6hr × 10-14 days, max adult dose

### Pertussis (whooping cough) caused by *Bordetella pertussis* or for postexposure pertussis prophylaxis

**Adult:** PO 500 mg PO qid (2 g total) × 14 days
**Adolescent/child/infant:** PO 40-50 mg/kg/day (max 2 g/day) in 4 divided doses × 14 days

### Primary or secondary syphilis (caused by *Treponema pallidum*) in penicillin-allergic, nonpregnant patients

**Adult:** PO (CDC) 500 mg qid × 14 days as an alternative therapy

### Surgical infection prophylaxis as a bowel preparation in combination with neomycin

**Adult:** It is generally recommended that if surgery is scheduled for 8 AM, 1 g erythromycin PO with neomycin sulfate PO should be given at 1 PM, 2 PM, and 11 PM on the day before surgery

### Impetigo/burn wound infection (unlabeled)

**Adult:** PO 250-500 mg q6hr (base, estolate, stearate) or 400-800 mg (ethylsuccinate) q6hr
**Adolescent/child/infant:** PO 20-50 mg/kg/day divided q6hr

**Available forms:** Base: enteric-coated tab 250, 333, 500 mg; film-coated tab 250, 500 mg; enteric-coated caps, 250, 333 mg; stearate: film-coated tabs, 250 mg, granules for oral susp: 200, 400 mg/5 ml powder for inj 500 mg, 1 g (lactobionate); 1 g (as gluceptate)

### Implementation

- Store at room temp; store susp in refrigerator
- Adequate intake of fluids (2 L) during diarrhea episodes

**PO route**

- Give around the clock on an empty stomach, at least 1 hr before or 2 hr after meals; may be taken with food if GI upset occurs; do not take with juices; take dose with a full glass of water: use calibrated measuring device for drops or susp; shake well
- Store susp in refrigerator
- Do not crush or chew enteric-coated tab

**IV route**

- Add 10 ml of sterile water for inj without preservatives to 250- or 500-mg vials and 20 ml to 1-g vial; sol is stable for 1 wk after reconstitution if refrigerated

**Intermittent IV infusion route**

- Dilute further in 100-250 ml of 0.9% NaCl or $D_5W$
- Give over 20-60 min to avoid phlebitis; assess for pain along vein; slow inf if pain occurs; apply ice to site and notify prescriber if unable to relieve pain

**Continuous infusion route**

- May also be administered as an inf in a dilution of 1 g/L of 0.9% NaCl, $D_5W$, over 4 hr

### Erythromycin lactobionate

**Y-site compatibilities:** Acyclovir, alfentanil, amikacin, aminocaproic acid, aminophylline, amiodarone, anidulafungin, argatroban, atenolol, atosiban, atracurium, atropine, azaTHIOprine, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, cefotaxime, cefTAZidime, cefTRIAXone, cefuroxime, chlorproMAZINE, cimetidine, CISplatin, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexmedetomidine, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doxacurium, doxapram, DOXOrubicin, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, epoetin, eptifibatide, ertapenem, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, folic acid, foscarnet, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, insulin (regular), irinotecan, isoproterenol, labetalol, levofloxacin, lidocaine, LORazepam, LR, mannitol, mechlorethamine, meperidine, methicillin, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metroNIDAZOLE, miconazole, midazolam, milrinone, mitoXANtrone, morphine, multiple vitamins injection, mycophenolate nafcillin, nalbuphine, naloxone, nesiritide, netilmicin, niCARdipine, nitroglycerin, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, papaverine, pentamidine, pentazocine, perphenazine, phenylephrine, phytonadione, piperacillin, piperacillin-tazobactam, polymyxin B, procainamide, prochlorperazine, promethazine, propranolol, protamine, pyridoxine, quiNIDine, ranitidine, Ringer's, ritodrine, sodium acetate/bicarbonate, succinylcholine, SUFentanil, tacrolimus, temocillin,

teniposide, theophylline, thiamine, thiotepa, tigecycline, tirofiban, TNA, tobramycin, tolazoline, TPN, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, vitamin B complex/C, voriconazole, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CNS:** Seizures
**CV:** Dysrhythmias, QT prolongation
**EENT:** Hearing loss, tinnitus
**GI:** *Nausea, vomiting, diarrhea,* abdominal pain, stomatitis, heartburn, anorexia, pruritus ani, pseudomembranous colitis, esophagitis, hepatotoxicity
**GU:** *Vaginitis, moniliasis*
**INTEG:** Rash, urticaria, pruritus, thrombophlebitis, injection-site reactions (**IV** site)
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO) |
| **Distribution** | Widely distributed; minimally distributed (CSF); crosses placenta |
| **Metabolism** | Liver, partially |
| **Excretion** | Bile, unchanged; kidneys (minimal), unchanged |
| **Half-life** | 1-3 hr |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | 1 hr | Rapid |
| **Peak** | 1-4 hr | Infusion's end |
| **Duration** | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Alfentanil, ALPRAZolam, bromocriptine, busPIRone, carBAMazepine, cilostazol, clindamycin, cloZAPine, cycloSPORINE, diazepam, digoxin, disopyramide, felodipine, ibrutinib, methylPREDNISolone, midazolam, quiNIDine, rifabutin, sildenafil, tacrolimus, tadalafil, theophylline, triazolam, vardenafil, vinBLAStine, warfarin: increased toxicity, increased action

Diltiazem, itraconazole, ketoconazole, nefazodone, pimozide, verapamil: increased serious dysrhythmias, do not use together

### Drug classifications

Ergots: increased action, toxicity
HMG-CoA reductase inhibitors: increased action, toxicity
Products that increase QT prolongation: increased QT
Protease inhibitors: serious dysrhythmias rifamycins (rifabutin, rifAMPin, rifapentine)
Decrease: erythromycin effect

### Drug/food

Grapefruit juice, avoid using together
Decrease: Erythromycin metabolism

### Drug/lab test

Increased: AST/ALT
Decreased: folate assay
False increase: 17-OHCS/17-KS

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for previous sensitivity reaction
- **Assess patient for signs and symptoms of infection** including characteristics of wounds, sputum, urine, stool, WBC >10,000/mm$^3$, earache, fever; obtain baseline information before, during treatment
- Obtain C&S test results before beginning product therapy to identify if correct treatment has been initiated
- Assess for allergic reactions: rash, urticaria may occur a few days after therapy begins
- Identify urine output; if decreasing, notify prescriber (may indicate nephrotoxicity); also monitor increases in BUN, creatinine
- Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test monthly if patient is on long-term therapy
- Monitor electrolytes: potassium, sodium, chloride monthly if patient is on long-term therapy
- **Assess for overgrowth of infection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum
- **Pregnancy/breastfeeding:** Use only if clearly needed, use other form of erythromycin, avoid estolate salt, use caution in breastfeeding, appears in breast milk
- **Pseudomembranous colitis:** assess for diarrhea with blood, mucus, abdominal pain, fever, product should be discontinued immediately
- **Anaphylaxis:** assess for generalized hives, itching, flushing, swelling of lips/tongue/throat, wheezing; have emergency equipment nearby
- **QT prolongation:** may occur (IV >15 mg/min), those with electrolyte imbalances, congenital QT prolongation, and the elderly are at greater risk; correct electrolyte imbalances prior to treatment; monitor ECG

### Patient/family education

- Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)

• Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate superinfection
• Instruct patient to take all medication prescribed for the length of time ordered
• Teach patient to avoid use with other products unless approved by prescriber

### Evaluation

**Positive therapeutic outcome**

• Absence of signs/symptoms of infection (WBC $<10{,}000/mm^3$, temp WNL, absence of red, draining wounds, earache)
• Reported improvement in symptoms of infection

## TREATMENT OF OVERDOSE:

Withdraw product, maintain airway, administer EPINEPHrine, aminophylline, $O_2$, **IV** corticosteroids

## erythromycin ophthalmic

*See Appendix B*

## erythromycin topical

*See Appendix B*

## escitalopram (Rx)

(es-sit-tal′oh-pram)

**Cipralex ✱, Cipralex Meltz ✱, Lexapro**

Func. class.: Antidepressant, selective serotonin reuptake inhibitor

**ACTION:** Inhibits CNS neuron uptake of serotonin but not of norepinephrine

**Therapeutic outcome:** Decreased symptoms of depression

**USES:** General anxiety disorder; major depressive disorder in adults/adolescents

**Unlabeled uses:** Panic disorder, social phobia, autism, hot flashes related to menopause

### CONTRAINDICATIONS

Hypersensitivity to this product or citalopram, MAOIs

**Precautions:** Pregnancy, breastfeeding, geriatric, renal/hepatic disease, history of seizures, abrupt discontinuation, bleeding, anticoagulants

**BLACK BOX WARNING:** Children ≤12 yr/adolescents, suicidal ideation

### DOSAGE AND ROUTES

**Adult/adolescent:** PO 10 mg/day in AM or PM; after 1 wk if no clinical improvement is noted, dosage may be increased to 20 mg/day PM; maintenance 10-20 mg/day; reassess to determine need for treatment

**Child ≥12 yr:** PO 10 mg qday, may increase to 20 mg qday after 21 days

Geriatric/hepatic dose: PO 10 mg/day

Hot flashes (menopause, unlabeled) Adult PO 10-20 mg qday × 8 wk

**Available forms:** Tabs 5, 10, 20 mg; oral sol 5 mg (as base)/5 ml (contains sorbitol)

### Implementation

• Give with food or milk for GI symptoms; give with full glass of water, one a day in the AM
• Give crushed if patient is unable to swallow medication whole, scored tabs can be cut
• Give dose at bedtime if oversedation occurs during the day
• Give gum, hard candy, frequent sips of water for dry mouth
• Oral sol: measure with calibrated device
• Store at room temperature; do not freeze
• Provide assistance with ambulation during therapy, because drowsiness, dizziness occur
• Provide safety measures primarily in geriatric
• Check to see if PO medication swallowed

### ADVERSE EFFECTS

**CNS:** *Headache, nervousness, insomnia,* suicidal ideation, *drowsiness, anxiety, tremor, dizziness, fatigue, sedation, poor concentration, abnormal dreams, agitation,* seizures, apathy, euphoria, hallucinations, delusions, psychosis, neuroleptic malignant syndrome–like reactions, ataxia, worsening depression
**CV:** *Hot flashes, palpitations,* angina pectoris, hemorrhage, hypertension, tachycardia, 1st-degree AV block, bradycardia, MI, thrombophlebitis, postural hypotension
**EENT:** Visual changes, ear/eye pain, photophobia, tinnitus, pupil dilation, dental pain
**GI:** *Nausea, diarrhea, dry mouth, anorexia, dyspepsia, constipation, cramps, vomiting, taste changes, flatulence, decreased appetite,* hepatitis
**GU:** *Dysmenorrhea, decreased libido, urinary frequency, UTI,* amenorrhea, cystitis, impotence, urine retention, ejaculation disorder
**HEMA:** Impaired platelet aggregation
**INTEG:** *Sweating, rash, pruritus,* acne, alopecia, urticaria, photosensitivity, bruising
**MS:** *Pain,* arthritis, twitching, osteopenia
**RESP:** *Infection, pharyngitis, nasal congestion, sinus headache, sinusitis, cough, dyspnea, bronchitis,* asthma, hyperventilation, pneumonia
**SYST:** *Asthenia, viral infection, fever, allergy, chills,* serotonin syndrome, neonatal abstinence syndrome, Stevens-Johnson syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Urine |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
Amantadine, bromocriptine, busPIRone, lithium, traMADol, tryptophan: increased serotonin syndrome
BusPIRone: increased symptoms of OCD
CarBAMazepine, lithium, phenytoin, warfarin: increased levels or toxicity of each specific product
Cyproheptadine: decreased escitalopram effect
Diazepam: increased half-life of diazepam
Haloperidol: increased effect of haloperidol

### Drug classifications

Antidepressants, opioids, sedatives: increased CNS depression
Antidysrhythmics, antipsychotics: increased levels, toxicity
Highly protein-bound products: increased side effects of escitalopram
MAOIs: do not use with or 14 days before escitalopram
NSAIDs, salicylates, anticoagulants, SSRIs, platelet inhibitors: increased bleeding risk
Phenothiazines: increased levels of phenothiazines
SSRIs, SNRIs, serotonin-receptor agonists, amphetamines: increased serotonin syndrome
Tricyclics: increased levels of tricyclics

### Drug/herb

Kava: increased CNS effect
St. John's wort: do not use together, serotonin syndrome may occur

### Drug/food

Grapefruit juice: increased escitalopram effect

### Drug/lab test

Increased: serum bilirubin, blood glucose, alkaline phosphatase
Decreased: VMA, 5-HIAA
False increase: urinary catecholamines

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Assess mental status: mood, sensorium, affect, **suicidal tendencies,** increase in psychiatric symptoms, depression, panic, not approved for use in children <12 yr

- Assess appetite in bulimia nervosa, weight daily, increase nutritious foods in diet, watch for bingeing and vomiting
- **Assess allergic reactions:** itching, rash, urticaria; product should be discontinued; may need to give antihistamine
- Monitor B/P (lying/standing), pulse q4hr; if systolic B/P drops 20 mm Hg, hold product, notify prescriber; take VS q4hr in patients with cardiovascular disease
- Monitor blood studies: CBC, leukocytes, differential, cardiac enzymes if patient is receiving long-term therapy; check platelets; bleeding can occur
- **Serotonin syndrome:** Assess for nausea, vomiting, sedation, dizziness, sweating, facial flushing, mental changes, shivering, increased B/P: discontinue, notify prescriber
- Monitor liver function tests: AST, ALT, bilirubin, creatinine; thyroid function studies
- Monitor weight qwk; appetite may decrease with product
- Monitor ECG for flattening of T wave, bundle branch, AV block, dysrhythmias in cardiac patients
- Monitor alcohol consumption; if alcohol is consumed, hold dose until AM
- **Pregnancy/breastfeeding:** Use only if benefit outweighs risk to fetus, if used during pregnancy, taper third trimester, use cautiously in breastfeeding, excreted in breast milk

### Patient/family education

- Teach patient that therapeutic effect may take 1-4 wk, may have increased anxiety for first 5-7 days, do not abruptly discontinue
- **Serotonin syndrome:** To report immediately nausea, vomiting, sedation, dizziness, sweating, facial flushing, mental changes, shivering
- Advise patient to use caution in driving, other activities requiring alertness because of drowsiness, dizziness, blurred vision
- Advise patient to use sunscreen to prevent photosensitivity
- Advise patient to avoid alcohol ingestion, other CNS depressants
- Advise patient to notify prescriber if pregnant or plan to become pregnant or breastfeed, discuss sexual dysfunction
- Advise patient to change positions slowly; orthostatic hypotension may occur

- Teach patient to avoid all OTC products unless approved by prescriber, to take without regard to meals
- Teach patient to report immediately signs of urinary retention

**BLACK BOX WARNING:** Teach patient that clinical worsening and suicide risk may occur, especially in adolescents and young adults, worsening of depression

- Teach patient using MedGuide provided
- Teach patient about drug interactions

### Evaluation

**Positive therapeutic outcome**

- Decreased depression

**⚠ HIGH ALERT**

## eslicarbazepine

(es'lye-kar-bay'ze-peen)

**Aptiom**

*Func. class.:* Anticonvulsant, misc

*Chem. class.:* Voltage-gated sodium channel (VGSC) blocker, carboxamide derivative

## ACTION

Exact mechanism unknown; a voltage-gated sodium-channel blocker inhibits repetitive neuronal firing

## USES

Partial seizures, adjunctive treatment

## CONTRAINDICATIONS

Hypersensitivity to this product or OXcarbazepine

**Precautions:** Breastfeeding, abrupt discontinuation, depression, driving/operating machinery, ethanol intoxication, hepatic disease, renal disease, hyponatremia, suicidal ideation, pregnancy

## DOSAGE AND ROUTES

**Adult: PO** 400 mg/day, after 1 wk increase to 800 mg/day, max 1600 mg/day

### Renal dose

**Adult:** PO CCr <50 ml/min, 200 mg/day, after 2 wk increase to 400 mg/day, max 800 mg/day

**Available forms:** Tab 200, 400, 600, 800 mg

### Implementation

- May be taken without regard to food
- May be crushed or swallowed whole
- Store at room temperature

## ADVERSE EFFECTS

**CNS:** Drowsiness, dizziness, amnesia, depression, insomnia, lethargy, memory impairment, confusion, fatigue, headache, speech disturbance, suicidal thoughts/behaviors, tremor

**CV:** Hypertension, peripheral edema

**EENT:** Blurred vision, nystagmus, diplopia

**GI:** Nausea, constipation, diarrhea, hypercholesterolemia/hypertriglyceride, vomiting, hepatotoxicity

**GU:** Cystitis

**INTEG:** Rash, Stevens-Johnson syndrome, toxic epidermal necrolysis, anaphylaxis, angioedema

**META:** Hyponatremia

**RESP:** Cough

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Urine, feces |
| **Half-life** | Terminal 13-20 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Bedaquiline, boceprevir, bosutinib, carbozantinib, cobicistat, elvitegravir, emtricitabine, crizotinib, cycloSPORINE, dronederone, erlotinib, fosamprenavir, galantamine, gefitinib, HYDROcodone, maraviroc, oxyCODONE, paliperidone, perampanel, pimozide, praziquantel, QUEtiapine, ranolazine, rilpivirine: decreased effects of these agents

CYP1A2, CYP2C19 substrates: decreased eslicarbamazepine effect

### Drug classifications

CYP3A inducers: decreased effect of these agents

## NURSING CONSIDERATIONS

### Assessment

- **Seizures:** character, location, duration, intensity, frequency, aura
- Hepatic studies: ALT, AST, bilirubin; sodium
- **Pregnancy/breastfeeding: Pregnancy:** Only use during pregnancy if the benefits of treatment clearly outweigh the risks to the fetus. Enroll in the North American Antiepileptic Drug (NAAED) Pregnancy Registry by calling 888-233-2334. Information on the registry can also be found at http://www.aedpregnancyregistry.org; the product is present in breast milk. Consider the benefits of breastfeeding, the risk of potential infant drug exposure, and the risk of an untreated or inadequately treated condition

• **Mental status:** mood, sensorium, affect, behavioral changes, suicidal thoughts/behaviors; if mental status changes, notify prescriber
• Eye problems: need for ophthalmic examinations before, during, after treatment (slit lamp, funduscopy, tonometry)
• **Allergic reaction:** purpura, red, raised rash; if these occur; product should be discontinued
• **Beers:** Avoid in older adults unless safer alternative is not available, may cause ataxia, impaired psychomotor function

### Patient/family education

• Instruct patient to carry emergency ID stating patient's name, products taken, condition, prescriber's name and phone number
• Instruct patient to avoid driving, other activities that require alertness, usually for the first 3 days of treatment
• Instruct patient not to discontinue medication quickly after long-term use
• **Pregnancy:** Instruct patient to notify prescriber if pregnancy is planned or suspected, avoid breastfeeding
• Instruct patient to report signs of decreased renal function, dizziness, increased cholesterol, ocular toxicity, suicidal ideation, skin rashes
• Teach patient to take with or without food; tablet can be crushed

### Evaluation

**Positive therapeutic outcome**

• Decreased seizure activity; document on patient's chart

**⚠ HIGH ALERT**

## esmolol (Rx)

(ez′moe-lole)
**Brevibloc**
*Func. class.:* β-Adrenergic blocker (antidysrhythmic II)

**Do not confuse:** esmolol/Osmitrol, Brevibloc/Brevital

**ACTION:** Competitively blocks stimulation of $\beta_1$-adrenergic receptors in the myocardium; produces negative chronotropic, inotropic activity (decreases rate of SA node discharge, increases recovery time), slows conduction of AV node, decreases heart rate, decreases $O_2$ consumption in myocardium; also decreases renin-aldosterone-angiotensin system at high doses; inhibits $\beta_2$-receptors in bronchial system at higher doses

**Therapeutic outcome:** Decreased supraventricular tachycardia

**USES:** Supraventricular tachycardias, noncompensatory sinus tachycardia, hypertensive crisis, intraoperative and postoperative tachycardia and hypertension, atrial fibrillation/flutter

**Unlabeled uses:** Hypertensive crisis/urgency, unstable angina

## CONTRAINDICATIONS

Heart block (2nd- or 3rd-degree), cardiogenic shock, HF, cardiac failure, hypersensitivity, severe bradycardia

**Precautions:** Pregnancy, breastfeeding, geriatric patients, hypotension, peripheral vascular disease, diabetes, hypoglycemia, thyrotoxicosis, renal disease, atrial fibrillation, bronchospasms, hyperthyroidism, myasthenia gravis, asthma, COPD, CV disease, pheochromocytoma, abrupt discontinuation

## DOSAGE AND ROUTES

### Atrial fibrillation/flutter

**Adult: IV** Loading dose 500 mcg/kg/min over 1 min; maintenance 50 mcg/kg/min for 4 min; if no response in 5 min, give 2nd loading dose; then increase INF to 100 mcg/kg/min for 4 min; if no response, repeat loading dose, then increase maintenance INF by 50 mcg/kg/min (max of 200 mcg/kg/min); titrate to patient response
**Child: IV** A total loading dose of 600 mcg/kg over 2 min, maintenance **IV** INF 200 mcg/kg/min, titrate upward by 50-100 mcg/kg/min q5-10 min until B/P, heart rate reduced by >10%

### Perioperative hypertension/tachycardia

**Adult:** IV immediate control 80 mg (bolus) over 30 seconds, then 150 mcg/kg/min, adjust to response, max 300 mcg/kg/min

### Hypertensive emergency (unlabeled)

**Adult:** IV 250-500 mcg/kg over 1 min, then IV INF 50-100 mcg/kg/min × 4 min

**Available forms:** Inj 10 mg, 250 mg/ml

### Implementation

**IV route**

• Check that correct concentration is being given
• The 10 mg/ml inj solution needs no dilution and may be used as an **IV** loading dose using handheld syringe

**Continuous IV infusion route**

• Ready-to-use bags premixed isotonic sol of 10 mg/ml and 20 mg/ml are available in 100, 250 ml bags; use controlled device, a central line is preferred, rate is based on patient's weight
• Store at room temperature for 24 hr; sol should be clear

**Y-site compatibilities:** Amikacin, aminophylline, ampicillin, amiodarone, atracurium, butorphanol, calcium chloride, ceFAZolin, cefmetazole, cefoperazone, cefTAZidime, ceftizoxime, chloramphenicol, cimetidine, cisatracurium, clindamycin, diltiazem, DOPamine, enalaprilat, erythromycin, famotidine, fentaNYL, gentamicin, heparin, hydrocortisone, regular insulin, labetalol, magnesium sulfate, methyldopate, metroNIDAZOLE, midazolam, morphine, nafcillin, nitroglycerin, norepinephrine, nitroprusside, pancuronium, penicillin G potassium, phenytoin, piperacillin, polymyxin B, potassium chloride, potassium phosphate, propofol, ranitidine, remifentanil, streptomycin, tacrolimus, tobramycin, trimethoprim/sulfamethoxazole, vancomycin, vecuronium, voriconazole, zoledronic acid

**Y-site incompatibilities:** Furosemide

## ADVERSE EFFECTS

**CNS:** Confusion, light-headedness, paresthesia, somnolence, fever, dizziness, fatigue, headache, depression, anxiety, seizures

**CV:** Hypotension, bradycardia, chest pain, peripheral ischemia, shortness of breath, HF, conduction disturbances 1st-, 2nd-, 3rd-degree heart block

**GI:** *Nausea,* vomiting, anorexia, gastric pain, flatulence, constipation, heartburn, bloating

**GU:** Urinary retention, impotence, dysuria

**INTEG:** *Induration, inflammation at inj site,* discoloration, edema, erythema, burning, pallor, flushing, rash, pruritus, dry skin, alopecia

**RESP:** Bronchospasm, dyspnea, cough, wheezing, nasal stuffiness, pulmonary edema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | 9 min |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | Unknown |
| **Duration** | 1-2 min |

## INTERACTIONS

### Individual drugs

Amphetamine, ePHEDrine, EPINEPHrine, norepinephrine, phenylephrine, pseudoephedrine: increased α-adrenergic stimulation

Clonidine: possibly fatal increased B/P

Digoxin: increased digoxin levels

DilTIAZem, verapamil: Increase: potentiate suppressive effects of these products

Thyroid hormones: decreased effect of salicylates, esmolol, decreased action of thyroid hormone

### Drug classifications

Antidiabetics: Increased: effect of antidiabetic

MAOIs, solatol: avoid use

General anesthetics: increased antihypertensive effect

### Drug/herb

Ephedra, hawthorn: decreased antihypertensive effect

### Drug/lab test

Interference: glucose/insulin tolerance test

## NURSING CONSIDERATIONS

### Assessment

- **Pregnancy/breastfeeding:** Use only if potential benefit justifies risk to fetus, use in last trimester of pregnancy or labor and obstetric delivery has resulted in fetal bradycardia, not known if excreted in breast milk
- **Dysrhythmias:** Monitor B/P during beginning treatment, periodically thereafter; pulse q4hr; note rate, rhythm, quality; apical/radial pulse before administration; notify prescriber of any significant changes (pulse <50 bpm); if severe, slow or stop infusion
- Check for baselines in renal, liver function tests before therapy begins
- **HF:** Assess for edema in feet, legs daily; monitor I&O, daily weight; check for jugular vein distention, crackles bilaterally, dyspnea
- **Bronchospasm:** Assess breath sounds and respiratory patterns
- **Infusion site:** Monitor infusion site during infusion, do not use butterfly if irritation occurs, stop and start at another site

### Patient/family education

- Teach patient not to drive or perform other hazardous activities if drowsiness occurs
- Teach patient to change positions slowly to prevent orthostatic hypotension
- Teach patient need for medication and expected results
- Caution patient to rise slowly to prevent orthostatic hypotension
- Advise patient to notify if pain, swelling occurs at **IV** site
- Teach patient to notify prescriber if chest pain, shortness of breath, wheezing, low B/P occur

### Evaluation

**Positive therapeutic outcome**

- Absence of dysrhythmias

## TREATMENT OF OVERDOSE:
Defibrillation, vasopressor for hypotension, IV glucagon if needed

## esomeprazole (Rx)
(es′oh-mep′rah-zohl)
**NexIUM, 24 hr**
*Func. class.:* Antiulcer, proton pump inhibitor
*Chem. class.:* Benzimidazole

**Do not confuse:** NexIUM/NexAVAR

## ACTION:
Suppresses gastric secretion by inhibiting hydrogen/potassium ATPase enzyme system in the gastric parietal cell; characterized as gastric acid pump inhibitor, since it blocks final step of acid production

**Therapeutic outcome:** Absence of duodenal ulcers; decreased gastroesophageal reflux

## USES:
Gastroesophageal reflux disease (GERD), adult/child/infant; severe erosive esophagitis; treatment of active duodenal ulcers in combination with antiinfectives for *Helicobacter pylori* infection; long-term use in hypersecretory conditions

## CONTRAINDICATIONS
Hypersensitivity to proton-pump inhibitors (PPIs)

**Precautions:** Pregnancy, breastfeeding, children, geriatric, hypomagnesemia, osteoporosis

## DOSAGE AND ROUTES
### Active duodenal ulcers associated with *H. pylori*
**Adult:** PO 40 mg/day × 10-14 days in combination with clarithromycin 500 mg bid × 10 days and amoxicillin 1000 mg bid × 10 days

### GERD/erosive esophagitis
**Adult:** PO 20 or 40 mg/day × 4-8 wk; no adjustment needed in renal, liver failure, geriatric; **IV** 20 or 40 mg/day up to 10 days
**Child and adolescent 12-17 yr:** PO 20 or 40 mg/day 1 hr before meals up to 8 wk
**Child 1-11 yr and ≥20 kg:** PO 10 mg/day 1 hr before meals for up to 8 wk
**Infant ≥1 mo:** **IV** 0.5 mg/kg over 10-30 min
**Infant 1-11 mo (>7.5-12 kg):** PO 10 mg daily up to 6 wk
**Infant 1-11 mo (5-7.5 kg):** PO 5 mg daily up to 6 wk
**Infant 1-11 mo (3-5 kg):** PO 2.5 mg daily up to 6 wk

### Hepatic dose
**Adult:** PO/IV max 20 mg/day (severe hepatic disease)

**Available forms:** Del rel caps 20, 40 mg; powder for **IV** inj 20, 40 mg/vial; del rel powder for oral susp 2.5, 5, 20, 40 mg

### Implementation
**PO route**
- Swallow caps whole; do not crush or chew; cap may be opened and sprinkled over Tbsp of applesauce
- Same time daily, 1 hr before meal
- **Oral susp (del rel):** empty contents of packet into container with 1 Tbsp of water, let stand 2-3 min to thicken, restir, give within 30 min of mixing; any residual product should be flushed with more water, taken immediately
- **NG tube (del rel oral susp):** add 15 ml water to contents of packet in syringe, shake, leave 2-3 min to thicken, shake, inject through NG tube within 30 min

**IV, direct route**
- Reconstitute each vial with 5 ml 0.9% NaCl, $D_5W$, LR; give over 3 min

**Intermittent IV INF route**
- Dilute reconstituted sol to 50 ml, give over 30 min, do not admix, flush line with $D_5W$, 0.9% NaCl, LR after inf

**Solution compatibilities:** $D_5W$, LR, 0.9% NaCl

## ADVERSE EFFECTS
**CNS:** *Headache, dizziness*
**GI:** *Diarrhea, flatulence,* abdominal pain, constipation, dry mouth, hepatic failure, hepatitis, microscopic colitis, *Clostridium difficile–associated diarrhea (CDAD)*
**INTEG:** *Rash,* dry skin
**MISC:** Heart failure
**RESP:** *Cough,* pneumonia
**SYST:** Stevens-Johnson syndrome, toxic epidermal necrolysis, exfoliative dermatitis

### Pharmacokinetics
| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 97% plasma protein bound |
| **Metabolism** | Liver (metabolites), by CYP2C19, CYP3A4 Asian, Black and some Caucasians may be poor metabolizers |
| **Excretion** | Urine (metabolites), feces (metabolites); in geriatric, elimination rate decreased, bioavailability increased |
| **Half-life** | 1-1½ hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1½ hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Calcium carbonate, clopidogrel, dapsone, indinavir, iron, itraconazole, ketoconazole, mycophenolate, vitamin $B_{12}$: decreased effect

Increase: effect of methotrexate, tacrolimus, warfarin

Cilostazol, clozapine, those drugs metabolized by CYP2C19, diazepam, digoxin, penicillins, saquinavir: increased effect, toxicity

### Drug/lab test

Interference: sodium, Hgb, WBC, platelets, magnesium

## NURSING CONSIDERATIONS

### Assessment

- **Assess GI system:** bowel sounds, abdomen for pain, swelling, anorexia, bloody stools; pseudomembranous colitis may occur
- **Hepatic failure, hepatitis:** monitor AST, ALT, alkaline phosphatase during treatment
- **Serious skin disorders:** Stevens-Johnson syndrome, toxic epidermal necrolysis, exfoliative dermatitis
- **Pregnancy/breastfeeding:** Use only if benefits clearly outweigh risk, avoid use, do not breastfeed

### Patient/family education

- Instruct patient to report severe diarrhea; product may have to be discontinued, rash
- Advise diabetic patients that hypoglycemia may occur
- Advise patient to avoid hazardous activities; dizziness may occur
- Teach patient to notify provider if pregnancy is planned or suspected, or if breastfeeding
- Advise patient to avoid alcohol, salicylates, ibuprofen; may cause GI irritation
- Teach patient to take ≥1 hr prior to meal; not to crush, chew delayed-release product, if missed, take as soon as remembered if not almost time for next dose, take full course prescribed "Patient Information"
- Teach patient if cap cannot be swallowed whole contents may be mixed with a tablespoon of applesauce
- Teach patient to notify all providers of all OTC/Rx or herbal products taken
- **Hypomagnesemia:** Teach patient if dizziness, fast heartbeat, tremors, weakness, spasm, cramps, notify prescriber

### Evaluation

**Positive therapeutic outcome**

- Absence of epigastric pain, swelling, fullness, decreased GERD

## estradiol (Rx)

(ess-tra-dye'ole)

**Estrace**

## estradiol cypionate (Rx)

**Depo-Estradiol**

## estradiol topical emulsion (Rx)

**Estrasorb**

## estradiol valerate (Rx)

**Delestrogen**

## estradiol transdermal system (Rx)

**Alora, Climara, Estraderm, Minivelle, Vivelle**

## estradiol transdermal spray (Rx)

**Evamist**

## estradiol vaginal tablet (Rx)

**Vagifem Dot**

## estradiol vaginal ring (Rx)

**Estring, Femring**

## estradiol gel (Rx)

**Divigel, Elestrin, Estrogel**

*Func. class.:* Estrogen, progestin

*Chem. class.:* Nonsteroidal synthetic estrogen

**ACTION:** Needed for adequate functioning of female reproductive system; affects release of pituitary gonadotropins, inhibits ovulation, promotes adequate calcium use in bone structure

**Therapeutic outcome:** Decreased tumor size in prostatic cancer; increased estrogen levels in menopause, female hypogonadism

**USES:** Vasomotor symptoms associated with menopause, inoperable breast cancer (selected cases), prostatic cancer, atrophic vaginitis, kraurosis vulvae, hypogonadism, primary ovarian failure, prevention of osteoporosis, castration

## CONTRAINDICATIONS

Pregnancy, breastfeeding, reproductive cancer, genital bleeding (abnormal, undiagnosed), protein S or C deficiency, antithrombin deficiency, angioedema, MI, stroke

**BLACK BOX WARNING:** Breast/endometrial cancer, thromboembolic disorders, MI, stroke

**Precautions:** Hypertension, asthma, blood dyscrasias, gallbladder disease, HF, diabetes mellitus, bone disease, depression, migraine headache, seizure disorders, renal/hepatic disease, family history of cancer of breast or reproductive tract, history of smoking, uterine fibroids, vaginal irritation/infection, history of angioedema, cardiac disease

**BLACK BOX WARNING:** Dementia, accidental exposure pets/children (topical)

## DOSAGE AND ROUTES

### Hormone replacement/menopause symptoms

**Adult:** TD 1 patch delivering 0.025, 0.0375, 0.05, 0.075, or 0.1 mg/day 2×/wk (Alora, Estraderm, Vivelle-Dot); 1 patch delivering 0.025, 0.0375, 0.05, 0.06, 0.075, or 0.1 mg/day replace q7 days (Climara); **GEL** apply entire unit dose packet to 5- × 7-inch area of upper thigh/day, alternate thighs; **SPRAY** (Evamist) 1 spray to inner surface of forearm/day in AM

### Menopause/hypogonadism/castration/ovarian failure

**Adult:** PO 0.5-2 mg/day 3 wk on, 1 wk off or continuously; IM 1-5 mg q3-4wk (cypionate), 1-5 mg q3-4wk; 10-20 mg q4wk (valerate); TOP Estraderm 0.05 mg/24 hr applied 2 ×/wk, Climara 0.05 mg/hr applied 1 ×/wk in a cyclic regimen; women with hysterectomy may use continuously

### Prostatic cancer

**Adult:** IM 30 mg q1-2wk (valerate); PO 1-2 mg tid (oral estradiol)

### Breast cancer (palliative treatment)

**Adult:** PO 10 mg tid × 3 mo or longer

### Atropic vaginitis/kraurosis vulvae

**Adult:** VAG cream 2-4 g/day × 1-2 wk, then 1 g 1-3 ×/wk cycled; VAG tab 1/day × 2 wk, maintenance 1 tab 2 ×/wk; VAG ring inserted and left in place continuously for 3 mo

### Vasomotor symptoms

**Adult:** TOP after cleaning and drying skin on left thigh, calf, rub in contents of pouch using both hands until completely absorbed; wash hands

**Available forms: Estradiol:** tabs 0.5, 1, 2 mg; **valerate:** inj 10, 20, 40 mg/ml; **transdermal** 0.014, 0.025, 0.0375, 0.05, 0.075, 0.1 mg/24-hr release rate; **vag cream** 100 mcg/g; **vag ring** 2 mg/90 days; **vag tab** 10 mcg; **topical emulsion:** 2.5 mg; **gel** 0.1%, 0.06%, (Divigel); **spray** (Evamist) 1.53 mg/actuation

### Implementation

**PO route**

- Give titrated dose, use lowest effective dose
- Give with food or milk to decrease GI symptoms

**IM route**

- Administer deeply in large muscle mass; product is painful
- Rotate syringe to mix oil and medication

**Transdermal route**

- May contain aluminum or other metals in backing of patch, can overheat in MRI scan and burn patients
- Apply to area free of hair to ensure adhesion on trunk of body 2 ×/wk; press firmly and hold in place for 10 sec to ensure good contact; do not apply to breasts
- Start transdermal dose 7 days before last PO dose if routes are to be changed

**Topical route spray (Evamist)**

- Use daily; spray to inner upper arm; may increase to 2-3 ×/day based on response; let dry for 2 min, avoid secondary exposure to children, pets, caregivers

**Vaginal route**

- Place cream in applicator by attaching tube to applicator; squeeze cream into tube to mark; insert with patient reclining
- Use a new applicator daily

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, migraine, depression, seizures

**CV:** Hypertension, thrombophlebitis, edema, thromboembolism, stroke, pulmonary embolism, MI, chest pain

**EENT:** Contact lens intolerance, increased myopia, astigmatism, throat swelling, eyelid edema

**GI:** *Nausea,* vomiting, diarrhea, anorexia, pancreatitis, cramps, constipation, increased appetite, increased weight, cholestatic jaundice, hepatic adenoma

**GU:** Amenorrhea, cervical erosion, breakthrough bleeding, dysmenorrhea, vaginal candidiasis, breast changes, *gynecomastia, testicular atrophy, impotence;* increased risk of breast, endometrial cancer, changes in libido; toxic shock, vaginal wall ulceration/erosion (vag ring)

**INTEG:** Rash, urticaria, acne, hirsutism, alopecia, oily skin, seborrhea, purpura, erythema, pruritus, melasma; site irritation (transdermal)

**META:** Folic acid deficiency, hypercalcemia, hyperglycemia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed, crosses placenta |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Unknown |

### Pharmacodynamics

| | PO | IM | IV |
|---|---|---|---|
| **Onset** | Rapid | Slow | Rapid |
| **Peak** | Unknown | Unknown | Unknown |
| **Duration** | Unknown | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Calcium, phenylbutazone, rifampin: decreased estradiol action
CycloSPORINE, dantrolene: increased toxicity
Tamoxifen: decreased tamoxifen action

### Drug classifications

Anticoagulants: decreased action of anticoagulants
Anticonvulsants, barbiturates: decreased estradiol action
Corticosteroids: increased action of corticosteroids, tricyclics
Hypoglycemics (oral): decreased action of hypoglycemics

### Drug/herb

Black cohosh, DHEA: altered estrogen effect
Saw palmetto, St. John's wort: decreased estrogen effect

### Drug/food

Grapefruit juice: increased estrogen level

### Drug/lab test

Increased: BSP retention test; PBI; $T_4$; serum sodium; platelet aggregation; thyroxine-binding globulin (TBS); prothrombin; factors VII, VIII, IX, X; triglycerides
Decreased: serum folate, serum triglyceride, $T_3$ resin uptake test, glucose tolerance test, antithrombin III, pregnanediol, metyrapone test
False positive: LE prep, ANA titer

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Assess for previous breast/endometrial cancer, thromboembolic disorders, MI, stroke, dementia, use adequate screening for these conditions, estrogen increases the risk

- Monitor blood glucose in patient with diabetes; hyperglycemia may occur
- Monitor B/P q4hr; watch for increase caused by water and sodium retention
- Monitor I&O ratio; be alert for decreasing urinary output and increasing edema; monitor weight daily; notify prescriber if weekly weight gain is >5 lb; if increased, diuretic may be ordered
- Obtain liver function tests baseline, periodically, including AST, ALT, bilirubin, alkaline phosphatase, periodic folic acid level
- Assess edema, hypertension, cardiac symptoms, jaundice
- Assess mental status: affect, mood, behavioral changes, aggression; depression may occur, product may need to be discontinued
- Assess female patient for intact uterus; if so, progesterone should be added to estrogen therapy to decrease risk of endometrial cancer
- **Pregnancy/breastfeeding:** Do not use in pregnancy; estrogens decrease milk production, use only if clearly needed
- **Beers:** Avoid oral and topical patch in older adults, evidence of carcinogenic potential (breast, endometrial)

### Patient/family education

- Tell patient to take exactly as prescribed; do not double doses
- **Advise patient that increased weight gain and symptoms of fluid retention should be reported to prescriber:** edema of feet, ankles, sacral area; abnormal vaginal bleeding; breast lumps; hepatic disease (dark urine, clay-colored stools, jaundice of skin, sclera, pruritus); to report dermal rash with transdermal patch
- **Caution patient that thromboembolic symptoms should be reported:** tenderness in legs, chest pain, dyspnea, headaches, blurred vision
- Inform patient to use sunscreen and protective clothing because sunburns may occur
- Advise patient to stop smoking; smokers have a greater chance of thromboembolic disorder
- Teach patient to avoid grapefruit or grapefruit juice (PO)
- Teach patient that smoking increases CV conditions, encourage to stop
- Advise patient to notify prescriber if pregnancy is planned or suspected, and not to become pregnant when using estrogen
- Inform patient to report changes in blood glucose, if diabetic

### Evaluation

**Positive therapeutic outcome**

- Reversal of menopausal symptoms
- Decrease in tumor size in prostatic or breast cancer
- Decrease in itching, inflammation of vagina
- Absence of symptoms of osteoporosis

**⚠ HIGH ALERT**

**estrogens, conjugated, equine**
**(C.E.S 🍁, Congest 🍁, Premarin)**
**estrogens, conjugated (Rx) (synthetic A)**
**Cenestin, Premarin**
**estrogens, conjugated (synthetic B) (Rx)**
**Enjuvia**

**Do not confuse:** Premarin/Provera, Enjuvia/Januvia

**ACTION:** Needed for adequate functioning of female reproductive system; affects release of pituitary gonadotropins; inhibits ovulation; promotes adequate calcium use in bone structures

**Therapeutic outcome:** Decreased tumor size in prostatic cancer; increased estrogen levels in menopause, female hypogonadism

**USES:** Symptoms associated with menopause, inoperable breast cancer, prostatic cancer, abnormal uterine bleeding, hypogonadism, primary ovarian failure, prevention of osteoporosis, castration, atrophic vaginitis

## CONTRAINDICATIONS

Pregnancy, breastfeeding, thromboembolic disorders, reproductive cancer, genital bleeding (abnormal, undiagnosed), hypersensitivity, MI, stroke, phlebitis

**BLACK BOX WARNING:** Endometrial breast cancer, thromboembolic diseases

**Precautions:** Hypertension, asthma, blood dyscrasias, gallbladder disease, HF, diabetes mellitus, bone disease, depression, migraine headache, seizure disorders, renal/hepatic disease, family history of cancer of breast or reproductive tract, history of smoking, hypothyroidism, obesity, SLE

**BLACK BOX WARNING:** Dementia

## DOSAGE AND ROUTES

### >> Estrogens, conjugated

**Menopause**
**Adult:** PO 0.3-1.25 mg/day 3 wk on, 1 wk off

**Prevention of osteoporosis**
**Adult:** PO 0.3 mg/day or in a cycle

**Atrophic vaginitis**
**Adult:** VAG cream 0.5 g/day × 21 days, off 7 days, repeat

**Prostatic cancer**
**Adult:** PO 1.25-2.5 mg tid

**Advanced inoperable breast cancer**
**Adult:** PO 10 mg tid × 3 mo or longer

**Abnormal uterine bleeding**
**Adult:** **IV**/IM 25 mg, repeat in 6-12 hr

**Castration/primary ovarian failure**
**Adult:** PO 1.25 mg/day 3 wk on, 1 wk off

**Hypogonadism**
**Adult:** PO 0.3 or 0.625 mg q day/3 wk on, 1 wk off; adjust to response

### >> Estrogens, conjugated synthetic B

**Menopause**
**Adult:** PO 0.625 mg/day initially, may increase based on response

**Available forms:** Tabs 0.3, 0.45, 0.625, 0.9, 1.25, 2.5 mg; inj 25 mg/vial; vag cream 0.625 mg/g; synthetic B: tabs 0.625, 1.25 mg

### Implementation

**PO route**

- Give titrated dose, use lowest effective dose
- Give in 1 dose in AM for prostatic cancer, vaginitis, hypogonadism
- Give with food or milk to decrease GI symptoms

**IM route**

- Reconstitute after withdrawing at least 5 ml of air from container and inject sterile diluent on vial side, rotate to dissolve
- Give IM inj deeply in large muscle

**Vaginal route**

- Place cream in applicator by attaching tube to applicator, squeeze cream into tube to mark, insert with patient recumbent
- Applicator should be washed after each use

**IV, direct route**

- Reconstitute as for IM, inject into distal port of running **IV** line of $D_5W$, 0.9% NaCl, LR, at a rate of 5 mg/min or less

**Y-site compatibilities:** Heparin/hydrocortisone, potassium chloride, vit B/C

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, migraine, depression, seizures, mood disturbances

**CV:** Hypertension, thrombophlebitis, edema, thromboembolism, stroke, pulmonary embolism, MI, chest pain
**EENT:** Contact lens intolerance, increased myopia, astigmatism
**GI:** *Nausea,* vomiting, diarrhea, anorexia, pancreatitis, cramps, constipation, increased appetite, cholestatic jaundice, hepatic adenoma, weight gain/loss
**GU:** Amenorrhea, cervical erosion, breakthrough bleeding, dysmenorrhea, vaginal candidiasis, breast changes, *gynecomastia, testicular atrophy, impotence,* increased risk of breast, endometrial cancer, libido changes
**INTEG:** Rash, urticaria, acne, hirsutism, alopecia, oily skin, seborrhea, purpura, melasma
**META:** Folic acid deficiency, hypercalcemia, hyperglycemia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO), completely absorbed **(IV)** |
| **Distribution** | Widely distributed, crosses placenta |
| **Metabolism** | Liver, exclusively; hepatic recirculation |
| **Excretion** | Kidney |
| **Half-life** | Unknown |

### Pharmacodynamics

| | PO | IM | IV |
|---|---|---|---|
| **Onset** | Rapid | Slow | Immediate |
| **Peak** | Unknown | Unknown | Unknown |
| **Duration** | Unknown | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Bosentan, cycloSPORINE, dantrolene: increased toxicity
Phenylbutazone, rifampin: decreased action of estrogens
Tamoxifen, thyroid: decreased tamoxifen action

### Drug classifications

Anticoagulants: decreased action of anticoagulants
Anticonvulsants, barbiturates: decreased action of estrogens
Corticosteroids: increased action of corticosteroids
Oral hypoglycemics: decreased action of hypoglycemics
Tricyclic antidepressants: decreased effect of the antidepressant

### Drug/food

Grapefruit juice: increased estrogen level

### Drug/lab test

Increased: PBI, $T_4$; serum sodium; platelet aggregation; thyroxine-binding globulin (TBG); prothrombin; factors VII, VIII, IX, X; triglycerides
Decreased: serum folate, serum triglyceride, $T_3$ resin uptake test, glucose tolerance test, antithrombin III, metyrapone test
False positive: LE prep, ANA titer

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Breast, endometrial cancer: estrogens should not be used in known, suspected, or history of these disorders

**BLACK BOX WARNING:** Stroke, thromboembolic disease of MI: should not be used in these conditions or known protein C deficiency, protein S deficiency or antithrombin in deficiency

- Monitor blood glucose in patient with diabetes; hyperglycemia may occur
- Monitor B/P q4hr; watch for increase caused by water and sodium retention
- Monitor I&O ratio; be alert for decreasing urinary output and increasing edema; monitor weight daily; notify prescriber if weekly weight gain is >5 lb; if increased, diuretic may be ordered
- Obtain liver function tests, including AST, ALT, bilirubin, alkaline phosphatase
- Assess edema, hypertension, cardiac symptoms, jaundice
- Assess mental status: affect, mood, behavioral changes, aggression; depression may occur; product may need to be discontinued
- Assess female patient for intact uterus; if so, progesterone should be added to estrogen therapy to decrease risk of endometrial cancer; abnormal uterine bleeding, breast exam
- Pregnancy, estrogens decrease milk production, use only if clearly needed
- **Beers:** Avoid oral and topical patch in older adults, evidence of carcinogenic potential (breast, endometrial)

### Patient/family education

- Caution patient to take exactly as prescribed and not to double doses

**BLACK BOX WARNING:** Advise patient that increased weight gain and symptoms of fluid retention should be reported to prescriber: edema of feet, ankles, sacral area; abnormal vaginal bleeding; breast lumps; hepatic disease (dark urine, clay-colored stools, jaundice of skin, sclera, pruritus)

- **Caution patient that thromboembolic symptoms should be reported:** pain, redness, tenderness in legs; chest pain, dyspnea, headaches, blurred vision
- Inform patient that sunburns may occur and to use sunscreen and protective clothing
- Advise patient to stop smoking; smokers have a greater chance of thromboembolic disorder
- Tell patient to use nonhormonal birth control and to notify prescriber if pregnancy is suspected
- Tell patient that vasomotor symptoms improve in 2 wk, max relief 8 wk

### Evaluation

**Positive therapeutic outcome**

- Reversal of menopause symptoms
- Decrease in tumor size in prostatic, breast cancer
- Decrease in itching, inflammation of vagina
- Absence of symptoms of osteoporosis

**⚠ HIGH ALERT**

## eszopiclone (Rx)

(es-zop'i-klone)

**Lunesta**

*Func. class.:* Sedative-hypnotic, non-benzodiazepine

*Chem. class.:* Cyclopyrrolone

**Controlled substance schedule IV**

**ACTION:** Interacts with GABA receptors

**Therapeutic outcome:** Ability to sleep and stay asleep throughout the night

**USES:** Insomnia

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, geriatric, severe hepatic disease, abrupt discontinuation, COPD, depression, labor, sleep apnea, substance abuse, suicidal ideation, ethanol intoxication

## DOSAGE AND ROUTES

**Adult:** PO 1 mg immediately before bed, may increase to 2-3 mg if needed, max 3 mg nightly

### Hepatic dose/CYP3A4 inhibitors

**Adult:** PO 1 mg immediately before bed in severe hepatic disease, max 2 mg/day

**Available forms:** Tabs 1, 2, 3 mg

### Implementation

- Do not break, crush, or chew tab
- For short-term use only
- Give immediately before bedtime
- Avoid use with a high-fat meal
- Provide assistance with ambulation, nightlight, call bell within reach
- Check to see product is swallowed

## ADVERSE EFFECTS

**CNS:** Worsening depression, hallucinations, headache, daytime drowsiness, suicidal thoughts/actions, migraine, restlessness, anxiety, sleep driving, sleep walking

**CV:** Peripheral edema, chest pain

**GI:** Dry mouth, bitter taste (dysgeusia)

**GU:** Gynecomastia, dysmenorrhea

**INTEG:** Rash, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Extensively in the liver by CYP3A4, CYP2E1; protein binding 52%-59% |
| **Excretion** | Via kidneys |
| **Half-life** | 6 hr, geriatric 9 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | 1 hr |
| **Duration** | 6 hr |

## INTERACTIONS

### Drug classifications

CNS depressants: increased CNS depression

CYP3A4 inducers (dexamethasone, barbiturates, carBAMazepine, OXcarbazepine, phenytoin, fosphenytoin, ethotoin): Decrease: eszopiclone effect

CYP3A4 inhibitors (clarithromycin, itraconazole, ketoconazole, nefazodone, nelfinavir, ritonavir, troleandomycin): increased toxicity due to decreased eszopiclone elimination

### Drug/food

High-fat meal: decreased product action

### Drug/herb

- St. John's wort: Decrease: eszopiclone effect

## NURSING CONSIDERATIONS

### Assessment

- **Anaphylaxis, angioedema:** monitor during first dose
- **Assess sleep pattern:** ability to go to sleep, stay asleep; early morning awakenings; conservative methods used
- Monitor for abuse of this or other products
- **Pregnancy/breastfeeding:** Use in pregnancy only if clearly needed, avoid breastfeeding

### Patient/family education

- Caution patient that daytime drowsiness may occur; not to engage in hazardous activities until effect is known, memory problems may occur
- Advise patient that all other medications and supplements should be avoided unless approved by prescriber
- Advise patient to notify prescriber if pregnancy is suspected or planned
- Discuss alternative methods to improve sleep: reading, quiet environment, warm bath, milk
- Teach patient to avoid use after a high-fat meal
- Teach patient to swallow tab whole
- **CNS Depression/suicidal thoughts behaviors:** Teach patient how to recognize these problems
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, avoid breastfeeding
- **Beers:** Avoid in older adults with or at high risk for delirium
- Teach patient to notify prescriber of facial swelling, rash, complex sleeping disorders (sleep driving, sleep eating) change in thinking or behavior
- Teach patient that tolerance and dependence may occur after extended use
- Teach patient to take immediately before going to bed
- Teach patient to be aware of CNS depression and suicidal thoughts/behaviors, report at once

### Evaluation

**Positive therapeutic outcome**

- Ability to sleep and stay asleep throughout the night

## etanercept (Rx)

(eh-tan′er-sept)

**Enbrel**

*Func. class.:* Antirheumatic agent (disease-modifying) (DMARDs)

*Chem. class.:* Anti-TNF agent

**Do not confuse:** Enbrel/Leubid

**ACTION:** Binds to tumor necrosis factor (TNF), which decreases inflammation and immune response

**Therapeutic outcome:** Decreased pain, inflammation

**USES:** Acute, chronic rheumatoid arthritis that has not responded to other disease-modifying agents; polyarticular course juvenile rheumatoid arthritis (JRA), ankylosing spondylitis, plaque psoriasis, psoriatic arthritis

**Unlabeled uses:** Crohn's disease

## CONTRAINDICATIONS

Sepsis

**Precautions:** Pregnancy, breastfeeding, children <4 yr, geriatric, malignancies, HF, seizures, multiple sclerosis, latex hypersensitivity

**BLACK BOX WARNING:** Infection, lymphoma, neoplastic disease, TB

## DOSAGE AND ROUTES

### Rheumatoid/psoriatic arthritis, ankylosing spondylitis

**Adult:** SUBCUT 50 mg qwk or 25 mg 2×/wk, 3-4 days apart; may be used with methotrexate for psoriatic arthritis

**Child 2-17 yr:** SUBCUT 0.8 mg/kg/wk, max 50 mg/wk

### Plaque psoriasis

**Adult:** SUBCUT 50 mg 2 ×/wk × 3 mo, then 50 mg q wk maintenance

**Adolescent and child 4-17 yr (unlabeled):** SUBCUT 0.8 mg/kg/wk, max 50 mg/wk

### Juvenile rheumatoid arthritis (JRA)

**Adolescent and child 2-17 yr:** SUBCUT 0.8 mg/kg/wk, max 50 mg/wk

**Available forms:** Powder for inj 25 mg; inj 50 mg/ml; auto injector, single use

### Implementation

- May be administered by the patient or a caregiver after instruction. Assess the patient's or caregiver's ability to inject subcut and observe the first injection
- Administration of one 50 mg/ml prefilled syringe or autoinjector provides a dose equivalent to two, 25 mg prefilled syringes or two, 25 mg vials of lyophilized powder
- The needle cap on the prefilled syringe and on the SureClick autoinjector contain dry natural rubber (latex) and should not be handled by persons sensitive to this product

**Inj route**

- Inspect for particulate matter and discoloration prior to use, solution should be clear and colorless, although small white particles may be noted in the autoinjector or prefilled syringe

**Subcut route**

- Injection sites include front of the thigh; abdomen except the 2 inches around the navel; or outer area of the upper arm. Rotate injection sites. Do not administer where skin is tender, bruised, red, or hard. Also, do not inject directly into any raised, thick, red, or scaly skin patches or lesions related to psoriasis

**Reconstitution and administration of the vial**

• Do not mix or transfer the contents of one vial into another vial. Also, do not filter reconstituted product during preparation or administration. Do not add other medications to solutions containing etanercept. ONLY use the supplied diluent

• A vial adaptor is supplied for use when reconstituting the powder; the adaptor should not be used if multiple doses are going to be withdrawn from the vial. To reconstitute using the vial adaptor, slide the plunger into the flange end of the syringe. Attach the plunger to the gray rubber stopper in the syringe by turning the plunger clockwise until a slight resistance is felt. Remove the twist-off cap from the prefilled diluent syringe by turning counterclockwise. Once the twist-off cap is removed, twist the vial adapter onto the syringe clockwise until a slight resistance is felt. Place the vial adaptor over the top of the vial being careful not to bump or touch the plunger; the plastic spike inside the vial adaptor should puncture the gray stopper. Push the plunger down until all the liquid from the syringe is in the vial and gently swirl to dissolve the powder. After the diluent is added, some foaming may occur. Do not shake. Generally, dissolution takes less than 10 min; the solution should be clear and colorless. Each reconstituted vial contains 25 mg/ml of etanercept. Turn the vial upside down and slowly pull the plunger down to the unit markings on the side of the syringe that correspond with the needed dose. Gently tap the syringe to make any air bubbles rise to the top of the syringe, and slowly push the plunger up to remove them. Remove the syringe from the vial adapter by turning the syringe counterclockwise and attach the 27 gauge needle

• If the vial will be used for multiple doses, use a 25-gauge needle for reconstituting and withdrawing the solution. Insert the 25 gauge needle or the vial adapter straight into the center of the gray stopper. A "pop" will be felt. Inject the diluent very slowly. After the diluent is added, some foaming may occur. Do not shake. Swirl contents gently during dissolution. Generally, dissolution takes less than 10 minutes; the solution should be clear and colorless. Write the mixing date on the supplied sticker and attach to the vial. Each reconstituted vial contains 25 mg/ml of etanercept. Withdraw the correct dose of the solution into the syringe; remove any air bubbles. Remove the 25-gauge needle from the syringe. Attach a 27-gauge needle

• Hold the barrel of the syringe with one hand and pull the needle cover straight off. Hold the syringe in one hand like a pencil and use the other hand to gently pinch a fold of skin at the cleaned injection site. Insert the needle at a 45° angle to the skin. Let go of the skin, and hold the syringe near its base to stabilize it. Push the plunger to inject all of the solution at a slow, steady rate. Withdraw the needle at the same angle as insertion. Do NOT rub the site

• Use as soon as possible after reconstitution. Place reconstituted vials for multiple doses in the refrigerator at 2-8° C (36°-46° F) within 4 hr of reconstitution and may be stored up to 14 days. DO NOT FREEZE

**Use of the SureClick autoinjector**

• Allow to reach room temperature, do not shake. Immediately before use, remove the needle shield by pulling it straight off

• Stretch the skin under and around the prefilled autoinjector, place the open end against the injection site at a 90° angle. Without pushing the purple button on top, push the autoinjector firmly against the skin to unlock. Press the purple button on top once and release the button. Listen for the first click. Wait for the second click or wait 15 seconds, and remove the autoinjector from injection site. Do NOT rub the site

• Look at the inspection window. If it is not purple, call 1-888-436-2735; do not try to reuse the autoinjector

**Use of the prefilled syringe**

• **Single-use:** allow to come to room temperature, do not shake. Remove the needle shield. Check to see if the amount of liquid in the prefilled syringe falls between the two purple fill level indicator lines on the syringe. If bubbles are seen, very gently tap the syringe. Turn the syringe so that the purple horizontal lines on the barrel are directly facing you. Do not use if the syringe does not have the right amount of liquid

• Hold the barrel of the prefilled syringe with one hand and pull the needle cover straight off. Holding the syringe with the needle pointing up, check the syringe for air bubbles. If there are bubbles, gently tap until the air bubbles rise to the top of the syringe. Slowly push the plunger up to force the air bubbles out of the syringe

• Insert the needle at a 45° angle to the pinched skin. Push the plunger to inject all of the solution at a slow, steady rate. Withdraw the needle at the same angle as insertion. Do NOT rub the site

## ADVERSE EFFECTS

**CNS:** Headache, asthenia, dizziness, seizures

**CV:** Heart failure

**GI:** Abdominal pain, dyspepsia, vomiting, hepatitis, diarrhea

**HEMA:** Pancytopenia, anemia, thrombocytopenia, leukopenia, neutropenia
**INTEG:** Rash, *inj site reaction,* keratoderma blenorrhagicum
**RESP:** Pharyngitis, rhinitis, *cough, URI,* non-URI sinusitis
**SYST:** Serious infections, sepsis, death, malignancies, Stevens-Johnson syndrome, reactivation of hepatitis B virus, lupuslike syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed (60%) |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 115 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Anakinra, cyclophosphamide, rilonacept: avoid use
SulfaSALAzine: increased neutropenia

### Drug classifications

Immunizations: should be brought up to date before treatment
Immunizations, live virus vaccines: do not give concurrently

### Drug/lab test

Increased: LFTs

## NURSING CONSIDERATIONS

### Assessment

- **Rheumatoid arthritis:** assess for pain; check ROM, inflammation of joints, characteristics of pain
- Assess inj site for pain, swelling; usually occurs after 2 inj (4-5 days)
- **Pregnancy/breastfeeding:** Use only if clearly needed, use cautiously in breastfeeding, enroll in Amgen Pregnancy Surveillance Program 800-772-6436

**BLACK BOX WARNING: Infection:** patients using immunosuppressives, corticosteroids, methotrexate are at greater risk, assess for fever, discontinue in those that develop a serious infection, do not use in active infection, obtain testing before use, TB must be treated before use

**BLACK BOX WARNING:** Hypersensitivity: to this product, latex needle cap, benzyl alcohol; usual reaction to this product lasts 3-5 days

**BLACK BOX WARNING: Secondary malignancy:** Assess for lymphoma and other neoplastic diseases in children and adolescents, avoid in those with a history of malignancy

### Patient/family education

- Teach patient that product must be continued for prescribed time to be effective; to avoid aspirin, alcoholic beverages
- Instruct patient to use caution when driving; dizziness may occur
- Teach patient about self-administration, if appropriate: inj should be made in thigh, abdomen, upper arm; rotate sites at least 1 in from old site, check for injection reactions, reactions usually last 3-5 days

### Evaluation

**Positive therapeutic outcome**

- Decreased pain in arthritic conditions
- Decreased inflammation in arthritic conditions

## ethambutol (Rx)

(e-tham′byoo-tole)
**Etibi, Myambutol**
*Func. class.:* Antitubercular
*Chem. class.:* Diisopropylethylene diamide derivative

**Do not confuse:** ethambutol/Ethmozine

**ACTION:** Inhibits RNA synthesis, decreases tubercle bacilli replication

**Therapeutic outcome:** Resolution of TB infection

**USES:** Pulmonary TB, as an adjunct, other mycobacterial infections

## CONTRAINDICATIONS

Hypersensitivity, optic neuritis, child <13 yr

**Precautions:** Pregnancy, breastfeeding, renal disease, diabetic retinopathy, cataracts, ocular defects, hepatic and hematopoietic disorders

## DOSAGE AND ROUTES

**Adult and child >13 yr:** PO 15-25 mg/kg/day as a single dose or (treatment naive) or 25 mg/kg q day (treatment experienced)

### Renal dose

**Adult:** PO CCr 10-50 ml/min dose q24-36hr; CCr <10 ml/min dose q48hr

### Retreatment

**Adult:** PO 25 mg/kg/day as single dose × 2 mo with at least 1 other product, then decrease to 15 mg/kg/day as single dose, max 2.5 g/day
**Child:** PO 15 mg/kg/day

**Available forms:** Tabs 100, 400 mg

### Implementation
- Give with meals to decrease GI symptoms, at same time each day to maintain blood level
- 4 hr between this product and antacids
- Give antiemetic if vomiting occurs

## ADVERSE EFFECTS
**CNS:** *Headache, confusion,* fever, malaise, dizziness, *disorientation,* hallucinations, peripheral neuropathy
**EENT:** Blurred vision, optic neuritis, photophobia, decreased visual acuity
**GI:** *Abdominal distress, anorexia, nausea, vomiting*
**INTEG:** Dermatitis, pruritus, toxic epidermal necrolysis, erythema multiforme
**META:** *Elevated uric acid, acute gout,* liver function impairment
**MISC:** Thrombocytopenia, joint pain, anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Widely distributed, crosses blood-brain barrier, placenta |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, unchanged |
| **Half-life** | 3 hr, increased in liver, kidney disease |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | 2-4 hr |
| **Duration** | Unknown |

## INTERACTIONS
### Drug classifications
Aluminum, antacids: decreased absorption, separate by 4 hr
Neurotoxic agents, other: increased neurotoxicity

## NURSING CONSIDERATIONS
### Assessment
- Obtain C&S tests including sputum tests before initiating treatment; monitor qmo to detect resistance
- Monitor liver function tests qwk × 2 wk, then q2mo: ALT, AST, bilirubin; renal studies: before, qmo: BUN, creatinine output, specific gravity, urinalysis, uric acid; decreased appetite, jaundice, dark urine, fatigue
- Assess patient's mental status often: affect, mood, behavioral changes; psychosis may occur with hallucinations, confusion
- Assess patient for vision disturbance that may indicate optic neuritis: blurred vision, change in color perception; may lead to blindness
- **Serious skin reaction:** toxic epidermal necrolysis
- **Pregnancy/breastfeeding:** Use only if benefit outweighs risk, product appears in breast milk

### Patient/family education
- Advise patient that compliance with dosage schedule and duration is necessary to eradicate disease; to keep scheduled appointments, including ophthalmic appointments, or relapse may occur
- Caution patient to report weakness, fatigue, loss of appetite, nausea, vomiting, yellowing of skin or eyes, tingling/numbness of hands/feet, weight gain, or decreased urine output
- Instruct patient to report any vision changes; rash; hot, swollen, painful joints; numbness or tingling of extremities to physician
- Caution patient to inform prescriber if pregnancy is suspected

### Evaluation
**Positive therapeutic outcome**
- Decreased symptoms of TB
- Decrease in acid-fast bacteria

## etodolac (Rx)
(ee-toe-doe'lak)
**Ultradol** 🍁
*Func. class.:* Nonsteroidal antiinflammatory, nonopioid analgesic

**Do not confuse:** Lodine/codeine/iodine

**ACTION:** Inhibits COX 1,2; analgesic, antiinflammatory properties

**Therapeutic outcome:** Decreased pain, inflammation

**USES:** Mild to moderate pain, osteoarthritis, rheumatoid arthritis, arthralgia, myalgia, juvenile rheumatoid arthritis

## CONTRAINDICATIONS
Hypersensitivity; patients in whom aspirin, iodides, or other NSAIDs have produced asthma, rhinitis, urticaria, nasal polyps, angioedema, bronchospasm; coronary artery bypass graft surgery (CABG)

**Precautions:** Pregnancy, breastfeeding, children, geriatric, bleeding, GI/cardiac/renal/hepatic disorders, bronchospasm, nasal polyps, alcoholism, bone marrow suppression, MI, hemophilia, neutropenia, ulcerative colitis

**BLACK BOX WARNING:** GI bleeding, perforation, MI, stroke

## DOSAGE AND ROUTES

### Osteoarthritis

**Adult:** PO 300 mg bid-tid, or 400-500 mg bid initially, then adjust to 600-1200 mg/day in divided doses; max 1200 mg/day; ext rel 400-1000 mg/day

### Analgesia

**Adult:** PO 200-400 mg q6-8hr; max 1200 mg/day; patients <60 kg max 20 mg/kg

**Available forms:** Caps 200, 300 mg; tabs 400, 500 mg; ext rel tabs 400, 600 mg

### Implementation

- Do not break, crush, or chew ext rel tabs
- Administer with full glass of water to enhance absorption
- Administer with food or milk to decrease gastric symptoms; food will slow absorption slightly, will not decrease absorption

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, drowsiness, fatigue, tremors, confusion, insomnia, anxiety, depression, light-headedness, vertigo
**CV:** Tachycardia, peripheral edema, fluid retention, palpitations, dysrhythmias, HF
**EENT:** Tinnitus, hearing loss, blurred vision, photophobia
**GI:** *Nausea, anorexia,* vomiting, diarrhea, jaundice, cholestatic hepatitis, constipation, flatulence, cramps, dry mouth, peptic ulcer, dyspepsia, GI bleeding
**GU:** Nephrotoxicity, dysuria, hematuria, oliguria, azotemia, cystitis, UTI
**HEMA:** Blood dyscrasias
**INTEG:** Erythema, urticaria, purpura, rash, pruritus, sweating, Stevens-Johnson syndrome
**SYST:** Angioedema, anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Highly bound to plasma protein |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 7 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ½ hr |
| **Peak** | 1-2 hr |
| **Duration** | 4-12 hr |

## INTERACTIONS

### Individual drugs

**BLACK BOX WARNING:** Aspirin: may increase GI toxicity, NSAIDs

Cidofovir, cycloSPORINE, digoxin, lithium, methotrexate, phenytoin: increased toxicity

### Drug classifications

Aminoglycosides: Increased toxicity
Antacids: delayed etodolac effect
β-Adrenergic blockers: decreased effect
Diuretics: decreased effectiveness of diuretics

### Drug/herb

Arginine, gossypol: increased gastric irritation
Bearberry, bilberry: increased NSAIDs action
Bogbean, chondroitin, saw palmetto, turmeric: increased bleeding risk
St. John's wort: severe photosensitivity

### Drug/Lab

Increased: BUN, creatinine
Decreased: Hgb/Hct, WBC

## NURSING CONSIDERATIONS

### Assessment

- Assess pain: location, frequency, characteristics; relief after medication

**BLACK BOX WARNING:** Assess for GI bleeding: black stools, hematemesis

- Assess for asthma, aspirin hypersensitivity, nasal polyps that may be hypersensitive to etodolac
- Monitor blood counts during therapy; watch for decreasing platelets; if low, therapy may need to be discontinued, then restarted after hematologic recovery; watch for blood dyscrasia (thrombocytopenia): bruising, fatigue, bleeding, poor healing
- **Pregnancy/breastfeeding:** Avoid use unless benefits outweigh risks, avoid in third trimester due to constriction of fetal ductus arteriosus, do not breastfeed
- **Beers:** Avoid chronic use in older adults unless alternatives are not available, increased risk of GI bleeding/peptic ulcer disease

### Patient/family education

- Inform patient that product must be continued for prescribed time to be effective

**BLACK BOX WARNING:** avoid aspirin, alcoholic beverages, NSAIDs

- Caution patient to report bleeding, bruising, fatigue, malaise because blood dyscrasias can occur
- Instruct patient to use caution when driving; drowsiness, dizziness may occur
- Teach patient to take with a full glass of water to enhance absorption

### Evaluation

**Positive therapeutic outcome**

- Decreased pain
- Decreased inflammation
- Increased mobility

## etravirine (Rx)

(e-tra'veer-een)

**Intelence**

*Func. class.:* Antiretroviral

*Chem. class.:* Non-nucleoside reverse transcriptase inhibitor (NNRTI)

**ACTION:** Binds directly to reverse transcriptase, blocking the RNA- and DNA-dependent DNA polymerase action, causing a disruption of the enzyme's catalytic site

**Therapeutic outcome:** Increased CD4 count, decrease viral load

**USES:** In combination with other antiretroviral agents for HIV infection in treatment-experienced patients with evidence of HIV replication despite ongoing antiretroviral therapy

## CONTRAINDICATIONS

Hypersensitivity, breastfeeding

**Precautions:** Pregnancy, impaired hepatic function, children, antimicrobial resistance, geriatric patients, hepatitis, hypercholesterolemia, hypertriglycerides, immune reconstitution syndrome

## DOSAGES AND ROUTES

**Adult/child/adolescent ≥6 yr, ≥30 kg:** PO 200 mg bid

**Child/adolescent ≥6 yr, 25 to 29 kg:** 150 mg bid

**Child/adolescent ≥6 yr, 20 to 24 kg:** 125 mg bid

**Child/adolescent ≥6 yr, 16 to 19 kg:** 100 mg bid

**Available forms:** Tabs 100, 200 mg

### Implementation

- Give in combination with other antiretrovirals with food
- Store in cool environment; protect from light

## ADVERSE EFFECTS

**CNS:** *Headache, insomnia,* amnesia, anxiety, confusion, fatigue, nightmares, peripheral neuropathy, seizures, stroke, tremor

**CV:** Atrial fibrillation, hypertension, MI

**EENT:** Blurred vision

**GI:** *Nausea, vomiting, diarrhea, anorexia,* abdominal pain, increased AST/ALT, constipation, flatulence, gastritis, GERD, hematemesis, hepatitis, hepatomegaly, pancreatitis

**GU:** Renal failure

**HEMA:** Hemolytic anemia, neutropenia, thrombocytopenia, anemia

**INTEG:** *Rash,* erythema multiforme, angioedema, Stevens-Johnson syndrome

**MS:** Rhabdomyolysis

**OTHER:** Diabetes mellitus, gynecomastia, hyperamylasemia, hypercholesterolemia, hyperglycemia, hyperlipidemia

**RESP:** Dyspnea, bronchospasm

**SYST:** DRESS

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Plasma protein binding 99.9% |
| **Metabolism** | By CYP3A4, 2C9, 2C19 |
| **Excretion** | Feces |
| **Half-life** | 21-61 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Atazanavir, carBAMazepine, delavirdine, fosamprenavir, fosphenytoin, phenytoin, PHENobarbital, rifapentine, rifampin, tipranavir: do not use concurrently

CycloSPORINE, sirolimus, tacrolimus: altered effect

CYP3A4 inducers: amiodarone, atazanavir, clarithromycin, flecainide, fosamprenavir, lidocaine, mexiletine, propafenone, quiNIDine, sildenafil, tadalafil, vardenafil: decreased levels

CYP3A4 inhibitors: fluconazole, itraconazole, ketoconazole, lopinavir, posaconazole, ritonavir, voriconazole: increased etravirine levels

Darunavir, dexamethasone, disopyramide, efavirenz, nevirapine, ritonavir, tipranavir: decreased etravirine levels

Diazepam, rifampin, voriconazole, warfarin: increased levels

Methadone: increased withdrawal symptoms

### Drug classifications

HMG-CoA reductase inhibitors: increased myopathy, rhabdomyolysis

### Drug/herb

St. John's wort: decreased etravirine

## NURSING CONSIDERATIONS

### Assessment

- **HIV:** monitor blood counts q2wk; monitor viral load and CD4 counts during treatment; watch for decreasing granulocytes, Hgb; if low, therapy may have to be discontinued and restarted after hematologic recovery; blood transfusions may be required; cholesterol/lipid profile
- Assess symptoms of HIV and for possible infections; increased temp

- **Monitor for fatal hypersensitivity reactions:** fever, rash, nausea, vomiting, fatigue, cough, dyspnea, diarrhea, abdominal discomfort; treatment should be discontinued and not restarted; incidence of rash may be worse in women
- **Assess blood dyscrasias (anemia, granulocytopenia):** bruising, fatigue, bleeding, poor healing
- **Renal failure:** monitor renal studies: BUN, serum uric acid, CCr before, during therapy; these may be elevated throughout treatment
- Monitor hepatic studies before, during therapy: bilirubin, AST, ALT, amylase, alk phos, creatine phosphokinase, creatinine, qmo
- **Pregnancy/breastfeeding:** Use only if benefits outweigh risks, enroll pregnant patients in the Antiretroviral Pregnancy Registry 800-258-4263, do not breastfeed

### Patient/family education

- Inform patient that product is not a cure but will control symptoms; patient is still infective, may pass AIDS virus on to others
- Instruct patient to notify prescriber of sore throat, swollen lymph nodes, malaise, fever; other infections may occur; to stop product and notify prescriber immediately if skin rash, fever, cough, shortness of breath, GI symptoms occur; advise all health care providers that allergic reaction has occurred with etravirine
- Advise patient that follow-up visits must be continued since serious toxicity may occur; blood counts must be done
- Instruct patient to use contraception during treatment; still able to transmit disease
- Give patient Medication Guide and Warning Card, discuss points on guide
- Inform patient that other products may be necessary to prevent other infections
- Advise patient to take medication following a meal

### Evaluation

**Positive therapeutic outcome**

- Increased CD4 count, decreased viral load

**⚠ HIGH ALERT**

## everolimus (Rx)

(e-ve-ro'li-mus)

**Afinitor, Afinitor Disperz, Zortress**

*Func. class.:* Antineoplastic (miscellaneous)

*Chem. class.:* Kinase inhibitor

**Do not confuse:** everolimus/sirolimus/tacrolimus/temsirolimus

**ACTION:** Proliferation signal inhibitor that inhibits mammalian target of rapamycin (mTOR); this pathway is dysregulated in cancer

**USES:** Renal cell cancer in those with failed treatment with suritinib or sorafenib or SUNItinib, kidney transplant rejection prophylaxis with cycloSPORINE, subependymal giant cell astrocytoma, progressive pancreatic neuroendocrine tumor (PNET) with unresectable locally advanced metastatic disease, renal angiomyolipoma, tuberous sclerosis complex, breast cancer hormone receptor positive/HER-2 negative, liver transplant rejection prophylaxis

**Therapeutic outcome:** Decreasing tumor size, decreasing spread of malignancy

## CONTRAINDICATIONS

Breastfeeding; hypersensitivity to this product, Rapamune, and Torisel; pregnancy

**Precautions:** Children, renal/hepatic disease, diabetes mellitus, infection, hyperlipidemia, pleural effusion

**BLACK BOX WARNING:** Immunosuppression, infection, renal artery thrombosis, renal impairment, renal vein thrombosis, neoplastic disease, heart transplant

## DOSAGE AND ROUTES

### Kidney transplant rejection prophylaxis (Zortress)

**Adult:** PO 0.75 mg q12hr with cycloSPORINE in combination with basiliximab corticosteroids, reduced doses of cycloSPORINE

### Liver transplant rejection prophylaxis

**Adult:** PO 1 mg bid starting at least 30 days after transplant in combination with reduced-dose tacrolimus and corticosteroids

### Advanced renal cancer (Afinitor)

**Adult:** PO 10 mg qd as long as clinically beneficial; with strong CYP3A4 inducers 10 mg qd, may increase by 5-mg increments to 20 mg qd

### Progressive neuroendocrine tumor (PNET) (Afinitor only)

**Adult:** PO 10 mg/day, reduce dose to 5 mg/day if intolerable adverse reactions occur

### Subependymal giant cell astrocytoma (SEGA) (Afinitor only)

**Adult/adolescent/child ≥3 yr:** PO 4.5 mg/m$^2$, titrate to target trough level of 5-15 ng/ml

### For the treatment of patients with advanced renal cell cancer (RCC):

- For the treatment of patients with advanced renal cell cancer who have failed treatment with SUNItinib or SORAfenib:

**Oral dosage:**
**Adults:** 10 mg orally once daily. Continue treatment for as long as clinical benefit is observed or until unacceptable toxicity develops. Severe or intolerable adverse reactions may require temporary dose reduction and/or interruption of Afinitor. Dose adjustment is necessary if Afinitor is coadministered with some CYP3A4 inhibitors or inducers. Avoid concomitant use with strong CYP3A4 inhibitors

### For the treatment of advanced renal cell cancer (RCC) in combination with lenvatinib, after one previous antiangiogenic therapy:

**Oral dosage:**
**Adult:** 5 mg PO once daily in combination with lenvatinib 18 mg PO once daily; continue until disease progression or unacceptable toxicity. In a multicenter, open-label, phase II clinical trial, patients with advanced or metastatic RCC who had received prior antiangiogenic therapy were randomized to treatment with lenvatinib plus everolimus (combination therapy, $n = 51$) or everolimus monotherapy (10 mg per day, $n = 50$). The primary outcome of investigator-assessed median progression-free survival (PFS) was significantly improved in patients receiving combination therapy compared with everolimus monotherapy (14.6 mo vs. 5.5 mo; HR 0.37; 95% CI, 0.22–0.62); this was supported by a retrospective independent review of radiographs with an observed hazard ratio of 0.43 (95% CI, 0.24–0.75). Additionally, the median overall survival was 25.5 mo with combination therapy compared with 15.4 mo in patients treated with everolimus monotherapy (HR 0.67; 95% CI, 0.42–1.08), and the objective response rate was 37% versus 6%, respectively; all but one response (in a patient who received combination therapy) were partial responses

### For kidney transplant rejection prophylaxis in patients at low–moderate immunologic risk:

NOTE: The safety and efficacy of everolimus have not been established in patients at high immunologic risk
**Oral dosage (Zortress only):**
NOTE: Everolimus is FDA-approved for use with cycloSPORINE, USP modified formulation only; everolimus has not been evaluated in clinical trials with other formulations of cycloSPORINE. cycloSPORINE, USP modified is to be administered as oral capsules twice daily unless cycloSPORINE oral solution or intravenous administration cannot be avoided. cycloSPORINE and everolimus interact, so both the cycloSPORINE dose and the target range for whole blood trough concentrations are to be reduced when cycloSPORINE is given with everolimus. Avoid standard doses of cycloSPORINE with everolimus to reduce the risk of nephrotoxicity.
**Adult:** Initially, 0.75 mg PO every 12 hr (1.5 mg per day) in combination with basiliximab induction and concurrently with reduced doses of cycloSPORINE, USP modified and corticosteroids; administer as soon as possible after transplantation. Therapeutic drug monitoring of everolimus and cycloSPORINE is recommended for all patients. If needed, adjust everolimus dose at 4- to 5-day intervals. The everolimus dose may need adjustment based on blood concentrations, tolerability, individual response, concomitant medication change, or clinical situation. Initiate cycloSPORINE as soon as possible and no later than 48 hr after reperfusion of the graft, and adjust the cycloSPORINE dose to target whole blood trough concentrations from day 5 onward. In a clinical trial, the mean cycloSPORINE starting dose was 5.2 mg/kg per day. Initiate oral prednisone once oral medication is tolerated. According to guidelines, use of everolimus in combination with cycloSPORINE is effective in preventing rejection but is associated with enhanced nephrotoxicity and inferior outcomes, so significant reduction in the cycloSPORINE dosage is advised. If everolimus is used, guidelines recommend that it should not be started until graft function is established and surgical wounds are healed

### For the treatment of subependymal giant cell astrocytoma (SEGA) associated with tuberous sclerosis complex (TSC) in patients who require therapeutic intervention but are not candidates for curative surgical resection:

**Oral dosage (Afinitor only):**
**Adult, adolescent, and Children:** 4.5 mg/m$^2$ PO daily initially, then titrate dose to achieve a target trough level of 5 to 15 ng/ml. Continue therapy until disease progression or unacceptable toxicity; the optimal duration of therapy is unknown. Round dose to nearest strength of either Afinitor tablet or Afinitor DISPERZ. Adjust dose at 2-wk intervals based on trough concentrations, tolerability, clinical response, and concomitant drug changes. Severe or intolerable adverse reactions may require temporary dose reduction and/or interruption of Afinitor. Dose adjustment is necessary if Afinitor is coadministered with some CYP3A4 or P-glycoprotein (P-gp) inhibitors or inducers. Avoid concomitant use with strong CYP3A4 and/or P-gp inhibitors. Treatment with everolimus (median dose intensity, 5.9 mg/m2 per day; median duration of

therapy, 41.9 wk) resulted in a significantly improved subependymal giant cell astrocytoma (SEGA) response rate compared with placebo (35% vs. 0%; $p < .0001$) in patients with progressive SEGA associated with tuberous sclerosis complex (TSC) in a multinational, randomized, double-blind, placebo-controlled, phase III trial (the EXIST-1 trial; $n = 117$). Patients aged 0 to 65 years were eligible for study enrollment, and all patients had two or more main features of TSC; the median age in 78 patients who received everolimus was 9.5 yr (range, 1–23.9 years). A SEGA response rate was defined as at least a 50% total volume reduction from baseline in all target SEGA without evidence of 1) worsening nontarget SEGA, 2) new lesions (1 cm or greater in diameter), or 3) new or worsening hydrocephalus; confirmation of response was required 8 to 12 wk later. At a median follow-up time of 9.7 mo, the estimated 6-mo progression-free rate was significantly improved with everolimus therapy (100% vs. 86%; $p = .0002$). After 24 weeks of treatment, the median seizure frequency per 24 hr was unchanged from baseline with either everolimus or placebo. At a median follow-up time of 3.9 yr (range, 0.2–4.9 yr), the SEGA response rate was 57.7% and the median time to response was 5.3 mo (range, 2.5–33.1 mo) in patients who received everolimus on study or after crossing over from the placebo group (median duration of therapy 3.9 yr). Treatment with everolimus (3 mg/m2 per day PO initially, then titrated to trough concentrations of 5–15 ng/ml) led to a significant reduction in SEGA volume from baseline ($p < .001$) and seizure frequency ($p = .02$) at 6 mo compared with baseline in 28 patients (median age, 11 yr; range, 3–34 yr) with SEGA associated with TSC in a phase I–II study. At 6 mo, the median dose of everolimus was 5.6 mg/$m^2$ per day (range, 1.5–10.5 mg/$m^2$ per day). Additionally, a SEGA volume reduction of 30% or greater was achieved in 75% of patients and of 50% or greater was achieved in 32% of patients. At 60 mo, a SEGA volume reduction of 30% or greater and of 50% or greater occurred in 60.9% and 52.2% of patients, respectively, who received everolimus (median duration of therapy, 67.8 mo; range, 4.7–83.2 mo) in an extension trial ($n = 23$). At 60 mo, daily seizures were reported in 11.1% of patients who received everolimus compared with 26.9% of patients at baseline

### For the treatment of patients with unresectable, locally advanced, or metastatic neuroendocrine tumor (NET) or carcinoid tumors:

• For the treatment of progressive neuroendocrine tumor (NET) of pancreatic origin (also known as PNET) in patients with unresectable, locally advanced, or metastatic disease:

**Oral dosage:**

**Adult:** 10 mg PO once daily. Continue treatment for as long as clinical benefit is observed or until unacceptable toxicity develops. Severe or intolerable adverse reactions may require temporary dose reduction and/or interruption of Afinitor. Dose adjustment is necessary if Afinitor is coadministered with some CYP3A4 inhibitors or inducers. Avoid concomitant use with strong CYP3A4 inhibitors. In a multicenter, randomized, double-blind, placebo-controlled clinical trial of patients with locally advanced or metastatic advanced pancreatic neuroendocrine tumors (PNET) and disease progression within the prior 12 mo, treatment with everolimus ($n = 207$) significantly improved both investigator-assessed, progression-free survival (PFS) (investigator-assessed, 11 mo vs. 4.6 mo; HR 0.35; $p < .001$) and PFS by central review (13.7 mo vs. 5.7 mo; HR 0.38; $p < .001$) compared with placebo ($n = 203$). Overall survival was not significantly different between study arms (HR 0.94; $p = .3$); however, 85% of patients treated with placebo crossed over to receive everolimus after radiologic progression

### For the treatment of progressive, well-differentiated, nonfunctional neuroendocrine tumor (NET) of gastrointestinal or lung origin (also known as carcinoid) in patients with unresectable, locally advanced, or metastatic disease:

NOTE: Everolimus is not indicated for the treatment of patients with functional carcinoid tumors

**Oral dosage:**

**Adult:** 10 mg PO once daily. Continue treatment for as long as clinical benefit is observed or until unacceptable toxicity develops. Severe or intolerable adverse reactions may require temporary dose reduction and/or interruption of Afinitor. Dose adjustment is necessary if Afinitor is coadministered with some CYP3A4 inhibitors or inducers. Avoid concomitant use with strong CYP3A4 inhibitors. In a multicenter, randomized, double-blind, placebo-controlled clinical trial of patients with unresectable, locally advanced or metastatic, well differentiated, nonfunctional neuroendocrine tumors (NET) of gastrointestinal (excluding pancreatic) or lung origin and disease progression within the prior 6 mo, treatment with everolimus ($n = 205$) significantly improved progression-free survival (PFS) per independent radiological review (11 vs. 3.9 mo; HR 0.48; $p < .001$); the overall response rate was 2% in patients treated with Afinitor compared with 1% of those who received placebo. At

the time of the planned interim analysis, there was not a significant difference in overall survival (OS). Everolimus is not indicated for the treatment of patients with functional carcinoid tumors. In a multicenter, randomized, double-blind, placebo-controlled clinical trial, patients with advanced or metastatic functional carcinoid tumors were treated with depot octreotide in combination with Afinitor ($n$ = 429) or placebo; 67% of patients in the placebo group crossed over to receive Afinitor after progression. Combination therapy with Afinitor and depot octreotide did not improve PFS (primary outcome), and overall survival was better in patients who were treated with octreotide alone

## For the treatment of breast cancer:

### • For the treatment of hormone receptor–positive, HER2-negative advanced breast cancer in postmenopausal women who have failed treatment with letrozole or anastrozole in combination with exemestane

**Oral dosage (Afinitor only):**

**Postmenopausal females:** 10 mg PO once daily in combination with exemestane. Continue treatment for as long as clinical benefit is observed or until unacceptable toxicity develops. Severe or intolerable adverse reactions may require temporary dose reduction and/or interruption of Afinitor. Dose adjustment is necessary if Afinitor is coadministered with some CYP3A4 inhibitors or inducers. Avoid concomitant use with strong CYP3A4 inhibitors. Everolimus 10 mg/day PO (median duration, 14.6 wk) plus exemestane 25 mg/day PO (median duration, 17.4 wk) or placebo plus exemestane was evaluated in 724 postmenopausal women with estrogen receptor–positive, human epidermal growth factor receptor 2–negative metastatic or locally advanced breast cancer refractory to letrozole or anastrozole in a randomized, double-blind, phase III trial (the BOLERO-2 trial). The primary endpoint of investigator-assessed median progression-free survival (PFS) was significantly improved with everolimus plus exemestane compared with exemestane only (7.8 vs. 3.2 mo; hazard ratio [HR] = 0.45; p < .0001); median PFS based on central assessment was 11 vs. 4.1 mo (HR = 0.38; p < .0001). At a median follow-up time of 39.3 mo, median overall survival was 31 mo in patients treated with combination therapy compared with 26.6 mo in those who received exemestane alone

### For the treatment of hormone receptor–positive, HER2-negative metastatic breast cancer in postmenopausal women with secondary aromatase inhibitor resistance in combination with tamoxifen

**Oral dosage:**

**Postmenopausal females:** 10 mg PO once daily plus tamoxifen 20 mg PO once daily until disease progression or unacceptable toxicity results in significantly improved clinical benefit rate (primary endpoint, 61.1% vs. 42.1%; p = .045), time to progression (TTP) (7.6 vs. 4.5 mo; p = .0021), and overall survival (OS) (16 vs. 31 events; hazard ratio = 0.45; 95% CI, 0.24 to 0.81; p = .007) compared with tamoxifen alone (median follow-up, 24 mo) in a randomized, phase II study in 111 postmenopausal women with estrogen receptor–positive, human epidermal growth factor receptor 2–negative metastatic breast cancer and primary or secondary aromatase inhibitor resistance. No crossover was permitted. Primary hormone resistance was defined as relapse during adjuvant aromatase inhibitor (AI) therapy or disease progression within 6 mo of starting AI therapy for metastatic disease, and secondary hormone resistance was defined as relapse later than 6 mo or a previous response and subsequent progression after starting AI therapy for metastatic disease. In exploratory analyses, a statistically significant TTP and OS benefit was observed with combination therapy in women with secondary resistance (TTP: 14.8 vs. 5.5 mo, p = .0087; OS: 4 vs. 16 events, p = .002) but not primary resistance (TTP: 5.4 vs. 3.8 mo; OS: 12 vs. 15 events). A higher incidence of grade 3 and 4 stomatitis and anorexia was reported in the everolimus plus tamoxifen arm; 22% of patients in the combination therapy arm and 7% of patients in the tamoxifen alone arm discontinued treatment due to adverse events

### For the treatment of HER2-positive, trastuzumab-resistant, advanced breast cancer in patients previously treated with a taxane in combination with vinorelbine and trastuzumab:

**Oral dosage:**

**Adult:** 5 mg PO once daily plus vinorelbine 25 mg/m2 IV weekly and trastuzumab 4 mg/kg IV once followed by 2 mg/kg IV weekly until disease progression or unacceptable toxicity

### For the treatment of renal angiomyolipoma and tuberous sclerosis complex not requiring immediate surgery:

**Oral dosage (Afinitor only):**

**Adult:** 10 mg orally once daily. Continue treatment for as long as clinical benefit is observed or until unacceptable toxicity develops. Severe or intolerable adverse reactions may require temporary dose reduction and/or interruption of Afinitor. Dose adjustment is necessary if Afinitor is coadministered with some CYP3A4 inhibitors or inducers. Avoid concomitant use with strong CYP3A4 inhibitors. The confirmed response rate was 42% with everolimus therapy (median treatment duration, 38 wk) compared with 0% with placebo ($p < .0001$) in a randomized, double-blind, phase III trial in adult patients with renal angiomyolipoma as a feature of tuberous sclerosis complex ($n = 113$) or sporadic lymphangioleiomyomatosis ($n = 5$). Response was defined as a reduction in angiomyolipoma volume of 50% or more relative to baseline and absence of angiomyolipoma progression. The median time to response in the everolimus arm was 2.9 mo; all responses lasted between 10 and 85 wk. The median time to progression was not reached in the everolimus arm and was 11.4 mo in the placebo arm. Additionally, the 6-mo progression-free rates were 98% and 83% in the everolimus and placebo arms, respectively; the 12-mo progression-free rates were 92% and 25%, respectively

### For liver transplant rejection prophylaxis:

**Oral dosage:**

**Adult:** Initially, 1 mg PO twice daily started at least 30 days after transplantation in combination with reduced-dose tacrolimus and corticosteroids. Steroid doses may be further tapered based on the patient's clinical status and graft function. Therapeutic drug monitoring of everolimus and tacrolimus is recommended. In a trial, patients received tacrolimus plus corticosteroids with or without mycophenolate mofetil for the first 30 days and then tacrolimus (target trough concentration 3 to 5 ng/ml) and everolimus (target trough concentration 3 to 8 ng/ml) plus corticosteroids

### For the treatment of relapsed or refractory Waldenstrom macroglobulinemia:

**Oral dosage:**

**Adult:** 10 mg PO daily was evaluated in a single-arm, phase II trial (n = 60; the RAD001 trial). Each cycle consisted of 4 wk of treatment. Patients with stable disease or better after 6 cycles continued treatment per physician discretion until progression or unacceptable toxicity

### Therapeutic drug monitoring:

**Monitoring serum concentrations:**

• ***Zortress for kidney or liver transplant rejection prophylaxis:*** Guidelines suggest monitoring everolimus concentrations; a trough concentration is probably adequate. According to the manufacturer, routine everolimus whole blood therapeutic drug concentration monitoring is recommended for all patients who take everolimus for kidney or liver transplant rejection prophylaxis. The recommended everolimus therapeutic range is 3 to 8 ng/ml, based on the liquid chromatography mass spectrometry (LCMSMS) assay method used in clinical studies. Either the LCMSMS assay or immunoassay methods may be used to evaluate whole blood everolimus concentrations; however, these values may vary depending on the assay used and may not be interchangeable. Optimally, base everolimus dose adjustments on trough concentrations obtained 4 or 5 days after a previous dosing change. If the trough concentration is below 3 ng/ml, double the total daily dose of everolimus using the available tablet strengths; if the trough concentration is greater than 8 ng/ml on two consecutive measures, decrease the dose of everolimus by 0.25 mg twice daily. For liver transplant patients, ensure that the steady-state everolimus whole blood trough concentration is at least 3 ng/ml before reducing the tacrolimus dose. The recommended tacrolimus whole blood trough concentrations are 3 to 5 ng/ml by 3 wk after the first everolimus dose (approximately month 2) and through month 12 after transplantation. Limited data exist regarding dosing everolimus with tacrolimus trough concentrations of 3 to 5 ng/ml after 12 mo. For renal transplant patients, if impairment of renal function is progressive, adjust the treatment regimen. Ensure that the steady-state everolimus whole blood trough concentration is at least 3 ng/ml before reducing the cycloSPORINE dose. The recommended cycloSPORINE therapeutic range when administered with everolimus is 100 to 200 ng/ml through the first month after transplantation, 75 to 150 ng/ml during months 2 and 3 after transplantation, 50 to 100 ng/ml during month 4 after transplantation, and 25 to 50 ng/ml during months 6 through 12 after transplantation. Limited data exist regarding dosing everolimus with cycloSPORINE trough concentrations of 25 to 50 ng/ml after 12 mo. Also, monitor everolimus blood concentrations in **patients with hepatic impairment**, during concomitant administration of CYP3A4 inducers or inhibitors, when switching cycloSPORINE formulations, and/or when cycloSPORINE dosing is reduced according to recommended target

concentrations; everolimus concentrations may decrease if cycloSPORINE exposure is reduced. In addition to drug concentrations, carefully consider clinical signs and symptoms, tissue biopsies, and laboratory parameters

• ***Afinitor for subependymal giant cell astrocytoma (SEGA) with tuberous sclerosis complex (TSC):*** Routine everolimus whole blood therapeutic drug concentration monitoring is recommended for all patients; use the same assay and laboratory whenever possible. Determine everolimus trough concentrations approximately 2 wk after starting treatment. Titrate the dose to obtain trough concentrations of 5 to 15 ng/ml. Reduce the daily dose by 2.5 mg (Afinitor tablets) or 2 mg (Afinitor DISPERZ) if the trough concentrations are greater than 15 ng/ml. If dose reduction is required for patients receiving the lowest available strength, use alternate-day dosing. If the trough concentration is less than 5 ng/ml, increase the daily dose by 2.5 mg (Afinitor tablets) or 2 mg (Afinitor DISPERZ). Assess trough concentrations approximately 2 wk after any change in dose, after an initiation or change in coadministration of CYP3A4 and/or P-glycoprotein inducers or inhibitors, after any hepatic status change, or after a change in dosage form (e.g., Afinitor tablets to Afinitor DISPERZ). After a stable dose is obtained, monitor trough concentrations every 6 to 12 mo in patients with stable body surface area (BSA) or every 3 to 6 mo in patients with changing BSA

## Afinitor dosage guidance in patients on CYP3A4 and/or P-glycoprotein (P-gp) inducers/inhibitors

### Advanced hormone receptor–positive, HER2-negative breast cancer, advanced renal cell cancer, pancreatic neuroendocrine tumors, or renal angiomyolipoma with tuberous sclerosis complex

• *Strong CYP3A4 and/or P-gp inducers:* Avoid coadministration if possible. If a strong CYP3A4 is required, 10 mg PO once daily initially then consider increasing the dose by 5-mg increments up to 20 mg PO once daily. If the strong 3A4 inducer is discontinued, consider a washout period of 3 to 5 days and then resume the everolimus dose used before the initiation of the strong 3A4 inducer. NOTE: Dosage adjustment is based on pharmacokinetic data; no clinical data are available with this dosage adjustment

• *Strong CYP3A4 and/or P-gp inhibitors:* Avoid concomitant use

• *Moderate CYP3A4 and/or P-gp inhibitors:* Reduce the dose to 2.5 mg PO daily. A dose increase to 5 mg PO daily may be considered based on patient tolerance. If the moderate inhibitor is discontinued, allow a 2- to 3-day washout period before increasing the Afinitor dose; restart the Afinitor dose used before the initiation of the moderate CYP3A4 and/or P-gp inhibitor

### Subependymal giant cell astrocytoma with tuberous sclerosis complex

• *Strong CYP3A4 and/or P-gp inducers:* Avoid concomitant use if alternative therapy is available. If a concomitant strong CYP3A4 inducer is required, double the Afinitor dose or initiate Afinitor at 9 mg/m$^2$ PO once daily (round dose to nearest strength of either Afinitor tablet or Afinitor DISPERZ). Individualize subsequent dosing based on therapeutic drug monitoring. Assess trough concentrations approximately 2 wk after an initiation or change in coadministration with a CYP3A4 inducer and titrate dose to achieve/maintain trough levels of 5 to 15 ng/ml. If the strong CYP3A4 inducer is discontinued, adjust the everolimus dose to the one used before initiation of the CYP3A4 inducer and assess the everolimus trough concentration approximately 2 wk later

• *Strong CYP3A4 and/or P-gp inhibitors:* Avoid concomitant use

• *Moderate CYP3A4 and/or P-gp inhibitors:* Reduce the Afinitor dose by 50% or initiate Afinitor at 2.5 mg/m2 PO once daily (round dose to nearest strength of either Afinitor tablet or Afinitor DISPERZ). Individualize subsequent dosing based on therapeutic drug monitoring. Assess trough concentrations approximately 2 wk after an initiation or change in coadministration with a CYP3A4 inhibitor and titrate dose to achieve/maintain trough levels of 5 to 15 ng/ml. If the moderate inhibitor is discontinued, adjust the everolimus dose in 2 to 3 days to the one used before initiation of the moderate CYP3A4 and/or P-gp inhibitor and assess the everolimus trough concentration approximately 2 wk later

## Afinitor dosage adjustments due to treatment-related toxicity:

NOTE: Reduce dose to approximately 50% of the previous dose if a dose reduction is required due to severe or intolerable adverse reactions. In patients with SEGA with TSC, consider alternate-day dosing if a dose reduction is needed in a patient receiving the lowest available strength

### Noninfectious pneumonitis

• *Grade 1, asymptomatic with radiographic findings only:* No dose adjustment required

• *Grade 2, symptomatic but no interference with activities of daily living (ADL):* Consider withholding therapy. Resume Afinitor at a lower

dose when symptoms improve to grade 1 or less; discontinue Afinitor if symptoms do not improve within 4 wk
• *Grade 3, symptomatic and interfering with ADL and oxygen therapy indicated:* Hold therapy. Consider resuming Afinitor at a lower dose when symptoms improve to grade 1 or less. Consider discontinuing Afinitor if grade 3 toxicity recurs
• *Grade 4, life threatening and ventilator support indicated:* Discontinue Afinitor therapy

***Stomatitis***
• *Grade 1, minimum symptoms and normal diet:* No dose adjustment required
• *Grade 2, symptomatic but can eat and swallow modified diet:* Hold therapy until symptoms improve to grade 1 or less, and resume Afinitor at the same dose. If grade 2 toxicity recurs, hold therapy and resume Afinitor at a lower dose when symptoms improve to grade 1 or less
• *Grade 3, symptomatic and unable to adequately eat or hydrate orally:* Hold therapy. Resume Afinitor at a lower dose when symptoms improve to grade 1 or less
• *Grade 4, symptomatic and life threatening:* Discontinue Afinitor therapy

**Other nonhematologic toxicity (excluding metabolic events)**
• *Grade 1:* No dose adjustment required if toxicity is tolerable
• *Grade 2:* No dose adjustment required if toxicity is tolerable. If toxicity is intolerable, hold therapy until symptoms improve to grade 1 or less, and resume Afinitor at the same dose. If grade 2 toxicity recurs, hold therapy and resume Afinitor at a lower dose when symptoms improve to grade 1 or less
• *Grade 3:* Hold therapy. Consider resuming Afinitor at a lower dose when symptoms improve to grade 1 or less. If grade 3 toxicity recurs, consider discontinuing therapy
• *Grade 4:* Discontinue Afinitor therapy

**Metabolic events (e.g., hyperglycemia, dyslipidemia)**
• *Grade 1 or 2:* No dose adjustment required
• *Grade 3:* Temporarily withhold therapy. Resume Afinitor at a lower dose
• *Grade 4:* Discontinue Afinitor therapy

## Maximum dosage limits

• Adult *Zortress:* Maximum dosage is based on everolimus trough concentrations (target of 3–8 ng/ml) *Afinitor:* 10 mg per day for advanced hormone receptor–positive breast cancer, advanced renal cell carcinoma, and renal angiomyolipoma with tuberous sclerosis complex (TSC); maximum dosage is based on everolimus trough concentrations (target of 5–15 ng/ml) for the treatment of subependymal giant cell astrocytoma (SEGA) associated with TSC
• Geriatric *Zortress:* Maximum dosage is based on everolimus trough concentrations (target of 3–8 ng/ml) *Afinitor:* 10 mg per day for advanced hormone receptor–positive breast cancer, advanced renal cell carcinoma, and renal angiomyolipoma with tuberous sclerosis complex (TSC); maximum dosage is based on everolimus trough concentrations (target of 5–15 ng/ml) for the treatment of subependymal giant cell astrocytoma (SEGA) associated with TSC
• Adolescent *Zortress:* Safety and efficacy have not been established *Afinitor:* Maximum dosage is based on everolimus trough concentrations (target of 5–15 ng/ml) for the treatment of subependymal giant cell astrocytoma (SEGA) associated with tuberous sclerosis complex (TSC). Safety and efficacy for other indications have not been established
• Children *Zortress:* Safety and efficacy have not been established *Afinitor (1 year or older):* Maximum dosage is based on everolimus trough concentrations (target of 5–15 ng/ml) for the treatment of subependymal giant cell astrocytoma (SEGA) associated with tuberous sclerosis complex (TSC). Safety and efficacy for other indications or patients less than 1 year of age have not been established
• Infant Safety and efficacy have not been established
• Neonate Safety and efficacy have not been established

## Patients with hepatic impairment dosing

**Advanced hormone receptor–positive, HER2-negative breast cancer, advanced renal cell cancer, pancreatic neuroendocrine tumors, or renal angiomyolipoma with tuberous sclerosis complex**

*Mild hepatic impairment (Child-Pugh class A):* Afinitor 7.5 mg PO once daily; decrease dose to 5 mg PO once daily if not well tolerated

*Moderate hepatic impairment (Child-Pugh class B):* Afinitor 5 mg PO once daily; decrease dose to 2.5 mg PO once daily if not well tolerated

*Severe hepatic impairment (Child-Pugh class C):* Afinitor 2.5 mg PO once daily may be initiated if the benefits of therapy outweigh the risk of toxicity from increased drug exposure; do not increase dose above 2.5 mg/day

## Subependymal giant cell astrocytoma with tuberous sclerosis complex

*Mild or moderate hepatic impairment (Child-Pugh class A or B):* No initial Afinitor dose

adjustment is necessary; however, individualize subsequent dosing based on therapeutic drug monitoring; assess Afinitor levels after 2 wk of a hepatic status change; titrate dose to achieve trough levels of 5 to 15 ng/ml

*Severe hepatic impairment (Child-Pugh class C):* Initiate Afinitor at 2.5 mg/m2 PO once daily (round dose to nearest strength of either Afinitor tablet or Afinitor DISPERZ); individualize subsequent dosing based on therapeutic drug monitoring; assess Afinitor levels after 2 wk and titrate dose to achieve/maintain trough levels of 5 to 15 ng/ml

### Renal and liver transplant rejection prophylaxis

*Mild hepatic impairment (Child-Pugh class A):* Reduce the initial Zortress daily dosage by approximately one third; monitor whole blood trough concentrations and adjust dose as necessary. Dose titration is needed if a patient's whole blood trough concentration as measured by an LC/MS/MS assay is not within the target trough concentration of 3 to 8 ng/ml

*Moderate hepatic impairment (Child-Pugh class B):* Reduce the initial Zortress daily dosage by approximately one half; monitor whole blood trough concentrations and adjust dose as necessary. Dose titration is needed if a patient's whole blood trough concentration as measured by an LC/MS/MS assay is not within the target trough concentration of 3 to 8 ng/ml

*Severe hepatic impairment (Child-Pugh class C):* Reduce the initial Zortress daily dosage by approximately one half; monitor whole blood trough concentrations and adjust dose as necessary. Dose titration is needed if a patient's whole blood trough concentration as measured by an LC/MS/MS assay is not within the target trough concentration of 3 to 8 ng/ml

### Patients with renal impairment dosing

Specific guidelines for dosage adjustments in renal impairment are not available; it appears that no dosage adjustments are needed

### Hepatic dose

**Adult:** PO (Child-Pugh A) Afinitor 7.5 mg/day; (Child-Pugh B) Afinitor 5 mg qd; not to be used in Child-Pugh C

**Available forms:** Tabs 0.25, 0.5, 0.75, 2.5 mg (Zortress); 2.5, 5, 7.5, 10 mg (Afinitor)

### Implementation

- Swallow tabs whole with a full glass of water; do not chew, crush, or break
- Afinitor: take at same time of day, consistently with or without food; if unable to swallow, disperse in 30 ml of water
- Zortress: must take consistently with or without food, give at same time of day q12h with cycloSPORINE
- Follow procedure for proper handling of antineoplastics
- Give all medications PO if possible, avoiding IM inj; bleeding may occur
- Store protected from light, at room temperature

### Afinitor adjustments for toxicity

**Noninfectious pneumonitis**

Grade 1, asymptomatic with radiographic findings only: No dose change

Grade 2, symptomatic but no interference with activities of daily living (ADL): Consider withholding therapy; resume Afinitor at a lower dose when symptoms improve to ≤ grade 1; discontinue Afinitor if symptoms do not improve within 4 wk

Grade 3, symptomatic and interfering with ADL and oxygen therapy indicated: Hold therapy; consider resuming Afinitor at a lower dose when symptoms improve to ≤ grade 1; consider discontinuing Afinitor if grade 3 toxicity recurs

Grade 4, life-threatening and ventilator support indicated: Discontinue therapy

Stomatitis

Grade 1, minimum symptoms and normal diet: No dose adjustment required

Grade 2, symptomatic but can eat and swallow modified diet: Hold therapy until symptoms improve to ≤ grade 1 and resume Afinitor at the same dose; if grade 2 toxicity recurs, hold therapy and resume Afinitor at a lower dose when symptoms improve to ≤ grade 1

Grade 3, symptomatic and unable to adequately eat or hydrate orally: Hold therapy; resume Afinitor at a lower dose when symptoms improve to ≤ grade 1

Grade 4, symptomatic and life-threatening: Discontinue therapy

Other nonhematologic toxicity (excluding metabolic events)

Grade 1: No dose adjustment required if toxicity is tolerable

Grade 2: No dose adjustment required if toxicity is tolerable; if toxicity is intolerable, hold therapy until symptoms improve to ≤ grade 1 and resume Afinitor at the same dose; if grade 2 toxicity recurs, hold therapy and resume Afinitor at a lower dose when symptoms improve to ≤ grade 1

Grade 3: Hold therapy; consider resuming Afinitor at a lower dose when symptoms improve to ≤ grade 1; if grade 3 toxicity recurs, consider discontinuing therapy
Grade 4: Discontinue Afinitor therapy
Metabolic events (hyperglycemia, dyslipidemia)
Grade 1 or 2: No dose adjustment required
Grade 3: Temporarily withhold therapy; resume Afinitor at a lower dose
Grade 4: Discontinue Afinitor therapy

## ADVERSE EFFECTS

**CNS:** *Headache, insomnia, paresthesia, chills,* fever, seizure, personality changes, dizziness
**CV:** *Hypertension, HF, peripheral edema,* chest pain
**EENT:** Blurred vision, photophobia, eyelid edema, epistaxis, sinusitis, cataracts, conjunctivitis
**GI:** Nausea, vomiting, diarrhea, constipation, stomatitis, anorexia, abdominal pain, dysgeusia, noninfectious hepatitis
**GU:** Renal failure, UTI, renal tubular necrosis
**HEMA:** Anemia, leukopenia, thrombocytopenia, hemorrhage
**INTEG:** *Rash, acne,* leukocytoclastic vasculitis
**META:** Hyperglycemia, increased creatinine, *hyperlipemia,* hypophosphatemia, weight loss
**RESP:** Pleural effusion, *dyspnea,* noninfectious pneumonitis, pneumonitis, pulmonary alveolar proteinosis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid |
| **Distribution** | Protein binding 74% |
| **Metabolism** | Extensively by CYP3A4 |
| **Excretion** | Feces 80%, urine 5% |
| **Half-life** | 30 hr, reduced by high-fat meal |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Cimetidine, cycloSPORINE, danazol, erythromycin: increased everolimus effect
CarBAMazepine, PHENobarbital, phenytoin, rifamycin, rifapentine

### Drug classifications

**BLACK BOX WARNING:** Immunosuppressants: increased nephrotoxicity

Antifungals, calcium channel blockers, CYP3A4 inhibitors (strong, moderate), HIV-protease inhibitors: increased everolimus effect
Vaccines: decreased effect of these products
Decrease: everolimus effect: CYP3A4 inducers

### Drug/herb

St. John's wort: may decrease the effect of everolimus

### Drug/food

Alters bioavailability; use consistently with or without food; do not use with grapefruit juice

### Drug/lab test

Increased: bilirubin, calcium, cholesterol, glucose, potassium, lipids, phosphate, triglycerides, uric acid
Decreased: calcium, glucose, potassium, magnesium, phosphate

## NURSING CONSIDERATIONS

### Assessment

- Monitor lipid profile: cholesterol, triglycerides, a lipid-lowering agent may be needed; blood glucose

**BLACK BOX WARNING:** Monitor **immunosuppression:** Hgb, WBC, platelets during treatment qmo; if leukocytes $<3000/mm^3$ or platelets $<100{,}000/mm^3$, product should be discontinued or reduced; decreased hemoglobulin level may indicate bone marrow suppression

- Monitor hepatic studies: alk phos, AST, ALT, amylase, bilirubin, and for hepatotoxicity: dark urine, jaundice, itching, light-colored stools; product should be discontinued

**BLACK BOX WARNING:** **Infection:** bacterial/fungal infections can occur and are more common with combination immunosuppression therapy

**BLACK BOX WARNING:** **Renal artery/vein thrombosis (Zortress):** may result in graft loss within 30 days after transplantation

- **Pregnancy/breastfeeding:** Avoid pregnancy by using effective contraception during and up to 2 mo after final dose, report exposure to the National Transplant Pregnancy Registry 877-955-6877, do not breastfeed

### Patient/family education

**BLACK BOX WARNING:** Advise to report fever, rash, severe diarrhea, chills, sore throat, fatigue; serious infections may occur; clay-colored stools, cramping (hepatotoxicity)

- Advise to avoid crowds, persons with known infections to reduce risk of infection
- Teach to use contraception before, during, and 12 wk after product has been discontinued, avoid breastfeeding

• Teach to notify prescriber if pregnancy is planned or suspected
• Advise not to use with grapefruit juice
• Inform to avoid live virus vaccines, that frequent lab tests are required
• Advise to take up to 6 hr after normally scheduled time if dose is missed
• Advise that product may decrease male/female fertility
• Teach that drinking alcohol is not recommended
• Teach patient to take consistently with or without food
• Teach patient to report visual changes, weight gain, edema, shortness of breath, impaired wound healing

### Evaluation

**Positive therapeutic outcome**
• Decreasing size of tumor, decreasing spread of malignancy

## evolocumab (Rx)

(e′-voe-lok′-ue-mab)
**Repatha**
*Func. class.:* Antilipemic

**ACTION:** Binds to low-density lipoproteins, a human monoclonal antibody (IgG1)

**USES:** Heterozygous, familial hypercholesterolemia, atherosclerotic disease

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, latex sensitivity

## DOSAGE AND ROUTES

**Heterozygous familial hypercholesterolemia or primary hyperlipidemia with established clinical atherosclerosis in patients who require additional lowering of LDL-C:**
**Adults: SUBCUT** 140 mg q2wk or 420 mg qmo. If switching dosage regimens, administer the first dose of the new regimen on the next scheduled date of the previous regimen

**Homozygous familial hypercholesterolemia in patients who require additional lowering of LDL-C:**
**Adults and adolescents:** 420 mg qmo

**Available forms:** Auto injector 140 mg/ml, solutions for inj 140 mg/ml

### Implementation

• Visually inspect for particulate matter and discoloration, solution is clear, colorless to pale yellow

**SUBCUT route**
• Prefilled syringe or SureClick autoinjector
• If stored in the refrigerator, warm to room temperature for ≥ 30 min before use. Do not shake
• Give into areas of the abdomen (except for a 2-in area around the umbilicus), thigh, or upper arm that are not tender, bruised, red, or indurated
• To use the 420-mg dose, give 3 injections consecutively within 30 min
• Rotate the site with each inj
• Do not administer with other injectable drugs at the same inj site

**Prefilled syringe administration**
• Do not pick up or pull the prefilled syringe by the plunger rod or gray needle cap. Hold the syringe by the barrel
• Pull the gray needle cap off. It is normal to see a drop of sol at the end of the needle. Do not remove any air bubbles in the syringe
• Pinch the skin inj site to create a firm surface approximately 2 in wide. Hold the pinch, and insert the needle into the skin using a 45- to 90-degree angle
• Push the plunger rod all the way down until the syringe is empty
• When done, release the plunger, and gently lift the syringe off skin

**SureClick autoinjector administration**
• Do not remove the orange cap until you are ready to inject
• Pull the orange cap off
• Stretch (thigh) or pinch (stomach or upper arm) the skin inj site to create a firm surface approximately 2 in wide. Hold the stretch or pinch, and place the autoinjector on the skin at 90 degrees
• Firmly push down onto the skin; when ready to inject, press the gray button. A click should be heard. Keep pushing on the skin and then lift the thumb. The inj could take about 15 sec. The window on the autoinjector will turn from clear to yellow when the inj is complete. A second click may be heard
• Remove the needle that will be automatically covered

## ADVERSE EFFECTS

**CNS:** Memory impairment, confusion
**GI:** Diarrhea
**MISC:** Edema
**MS:** *Myalgia*
**RESP:** Pharyngitis, sinusitis, cough
**SYST:** Infection, antibody formation
**INTEG:** Pruritus, injection-site reaction, erythema, ecchymosis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | At steady state 17-20 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 3-7 days |

## INTERACTIONS

### Drug/lab test

Increased: LFTs

## NURSING CONSIDERATIONS

### Assessment

• **Hypercholesterolemia:** obtain diet history; monitor fat content, lipid levels (triglycerides, LDL, HDL, total cholesterol), LFTs baseline and periodically during treatment

### Patient/family education

• Teach patient that compliance is needed
• Advise that risk factors should be decreased: high-fat diet, smoking, alcohol consumption, absence of exercise
• Advise patient to notify prescriber if pregnancy suspected, planned, or if breastfeeding
• Teach patient to report confusion, injection-site reactions

### Evaluation

• Positive therapeutic response: Decreased cholesterol, LDL; increased HDL

## exemestane (Rx)

(x-ee-mes′tane)
**Aromasin**
*Func. class.:* Antineoplastic
*Chem. class.:* Aromatase inhibitor

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** Advanced breast carcinoma that has not responded to other therapy in estrogen receptor–positive patients (postmenopausal), estrogen receptor-positive early breast cancer that has received tamoxifen

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity, premenopausal women

## DOSAGE AND ROUTES

**Adult:** PO 25 mg/day after meals; may need 50 mg/day if taken with a potent CYP3A4 inhibitor

**⚠ HIGH ALERT**

## exenatide (Rx)

(ex-en′a-tide)
**Bydureon, Byetta**
*Func. class.:* Antidiabetic
*Chem. class.:* Incretin mimetic

**ACTION:** Binds and activates known human GLP-1 receptor, mimics natural physiology for self-regulating glycemic control

**Therapeutic outcome:** Decreased polyuria, polydipsia, polyphagia; improved Hgb A1c

**USES:** Type 2 diabetes mellitus given in combination with metformin, sulfonylurea, or a thiazolidinedione, insulin glargine

## CONTRAINDICATIONS

Hypersensitivity

**BLACK BOX WARNING:** Medullary thyroid carcinoma, multiple endocrine neoplasia syndrome type 2 (MEN-2), thyroid cancer

**Precautions:** Pregnancy, geriatric, severe renal/hepatic/GI disease, vitamin D deficiency

## DOSAGE AND ROUTES

**Adult:** SUBCUT 5 mcg bid 1 hr before morning and evening meal; may increase to 10 mcg bid after 1 mo of therapy; ext rel subcut (Bydureon) 2 mg q7 days; ext rel inj 2 mg q7 days

**Available forms:** Inj 5, 10 mcg pen; ext rel powder for susp for inj 2 mg

### Implementation

• Store in refrigerator; unopened pen may be stored at room temperature after opening for up to 30 days

**Subcut route (regular release—Byetta)**

• Give SUBCUT only, do not give **IV**/IM
• Pen needles must be purchased separately and be compatible
• Prime prior to use
• Inject into thigh, abdomen, upper arm

**Subcut route (extended release—Bydureon)**

• Give 1× wk; the dose can be given at any time of day, without regard to meals
• Available as a single dose tray containing a vial of 2 mg, a prefilled syringe delivering 0.65 ml diluent, a vial connector, and two custom needles (23G, 5/16″) specific to this delivery system (one is a spare needle); do not substitute needles or any other components
• Inject immediately after the white/off-white powder is suspended in the diluent and transferred to the syringe

• Inject subcutaneously into the thigh, abdomen, or upper arm; rotate sites to prevent lipodystrophy
• Give 1 hr before meals, approximately 6 hr apart; if patient is NPO, may need to hold dose to prevent hypoglycemia
• Store in refrigerator; unopened pen may be stored at room temperature after opening for up to 30 days
• If added to insulin glargine, insulin detemir, a dosage reduction in these products may be required

## ADVERSE EFFECTS

**CNS:** *Headache*, *dizziness,* jittery feeling, restlessness, weakness
**ENDO:** Hypoglycemia, thyroid hyperplasia
**GI:** Nausea, vomiting, diarrhea, dyspepsia, anorexia, gastroesophageal reflux, weight loss, pancreatitis
**SYST:** Angioedema, anaphylaxis
**INTEG:** Serious injection-site reactions (cellulitis, abscess, skin necrosis)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Glomerular filtration |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Immediate release: 2.1 hr; ext rel: 2 wk |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Acetaminophen: may decrease the effect of acetaminophen
Acetaminophen (elixir), digoxin, lovastatin: decreased action of these products
Alcohol, disopyramide: increased hypoglycemia
Dextrothyroxine, niacin, triamterene: decreased hypoglycemia efficacy
Erythromycin, metoclopramide: do not use with exenatide

### Drug classifications

ACE inhibitors, anabolic steroids, androgens, fibric acid derivatives, sulfonylureas: increased hypoglycemia
Corticosteroids, phenothiazines: increased hyperglycemia
Estrogens, MAOIs, oral contraceptives, progestins, thiazide diuretics: decreased hypoglycemia

## NURSING CONSIDERATIONS

### Assessment

• Monitor fasting blood, glucose, A1c levels, postprandial glucose during treatment to determine diabetes control
• **Pancreatitis:** severe abdominal pain, with/without vomiting; product should be discontinued
• Assess for hypo/hyperglycemic reaction that can occur soon after meals; for severe hypoglycemia give **IV** $D_5W$, then **IV** dextrose solution
• **Anaphylaxis, angioedema:** product should be discontinued immediately
• Assess for nausea, diarrhea, vomiting, ability to tolerate product, may cause dehydration
• **Pregnancy/breastfeeding:** Use only if benefits clearly outweigh risks, if pregnant enroll in the Exenatide Pregnancy Registry 800-633-9081, do not breastfeed

### Patient/family education

• Teach patient symptoms of hypo/hyperglycemia, what to do about each; to have glucagon emergency kit available; to carry a glucose source (candy, sugar cube) to treat hypoglycemia
• Advise patient that product must be continued on daily or weekly basis (ext rel); explain consequences of discontinuing product abruptly
• Teach patient that diabetes is a lifelong illness; product will not cure disease
• Advise patient to carry emergency ID with prescriber and medications
• Advise patient to continue weight control, dietary restrictions, exercise, hygiene
• Inform patient that regular blood glucose monitoring and A1c testing is needed
• Advise patient to notify prescriber if pregnant or intend to become pregnant
• Advise patient to read "Information for the Patient" and "Pen User Manual"; provide education on self-injection
• **Pancreatitis:** if severe abdominal pain with or without vomiting occurs, seek medical attention immediately
• Review injection procedure, to store product in refrigerator, room temperature after first use, discard 30 days after first use, do not freeze, protect from light (Byetta)

### Evaluation

**Positive therapeutic outcome**

• Decrease in polyuria, polydipsia, polyphagia, clear sensorium; improved A1c, weight; absence of dizziness, stable gait

## ezetimibe (Rx)

(ehz-eh-tim′bee)
**Ezetrol, Zetia**
*Func. class.:* Antilipemic

**ACTION:** Inhibits absorption of cholesterol by the small intestine

**Therapeutic outcome:** Decreased cholesterol levels

**USES:** Hypercholesterolemia, homozygous familial hypercholesterolemia (HoFH), homozygous sitosterolemia

## CONTRAINDICATIONS

Hypersensitivity, severe hepatic disease

**Precautions:** Pregnancy, breastfeeding, children, hepatic disease

## DOSAGE AND ROUTES

**Adult: PO** 10 mg/day; may be given with HMG-CoA reductase inhibitor at same time; may be given with bile acid sequestrant; give ezetimibe 2 hr before or 4 hr after the bile acid sequestrant

**Available forms:** Tabs 10 mg

### Implementation

- Give without regard to meals

## ADVERSE EFFECTS

**CNS:** Fatigue, dizziness, headache
**GI:** Diarrhea, abdominal pain
**MISC:** Chest pain
**MS:** *Myalgias, arthralgias,* back pain, myopathy, rhabdomyolysis
**RESP:** Pharyngitis, sinusitis, cough, URI
**EENT:** Sinusitis, nasopharyngitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Small intestine, liver |
| **Excretion** | Urine (11%), feces (78%) |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Cholestyramine: decreased ezetimibe action
CycloSPORINE: increased action of ezetimibe

### Drug classifications

Antacids: decreased action of ezetimibe
Fibric acid derivatives, bile acid sequestrants: increased ezetimibe action

### Drug/lab test

Increase: LFTs

## NURSING CONSIDERATIONS

### Assessment

- **Hypercholesterolemia:** obtain diet history; monitor fat content, lipid levels (triglycerides, LDL, HDL, total cholesterol), LFTs baseline and periodically during treatment
- **Myopathy/rhabdomyolysis:** monitor for increased CPK; myalgia, muscle cramps, musculoskeletal pain, lethargy, fatigue, fever; more common when combined with statins
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

- Teach patient that compliance is needed
- Advise that risk factors should be decreased: high-fat diet, smoking, alcohol consumption, absence of exercise
- Advise patient to notify prescriber if pregnancy is suspected or planned or if breastfeeding
- Advise patient to notify prescriber if unexplained weakness, or muscle pain is present
- Teach patient to notify prescriber of dietary/herbal supplements

### Evaluation

**Positive therapeutic outcome**

- Decreased cholesterol

econazole topical
eletriptan (Rx)
empagliflozin
enalapril/enalaprilat (Rx)
entacapone (Rx)
epinastine ophthalmic
EPINEPHrine nasal agent
epoetin (Rx)
ergocalciferol
ertapenem (Rx)
erythromycin lactobionate (Rx)
erythromycin topical
esmolol (Rx)
estradiol cypionate (Rx)
estradiol transdermal system (Rx)
estradiol vaginal ring (Rx)
estrogens, conjugated (Rx) (synthetic A)
etanercept (Rx)
etravirine (Rx)
exemestane (Rx)
efavirenz (Rx)
eltrombopag
emtricitabine (Rx)
enfuvirtide (Rx)
entecavir (Rx)
EPINEPHrine (Rx, OTC)
epirubicin (Rx)
eprosartan (Rx)
eribulin (Rx)
erythromycin base (Rx)
erythromycin stearate (Rx)
escitalopram (Rx)
esomeprazole (Rx)
estradiol topical emulsion (Rx)
estradiol transdermal spray (Rx)
estradiol gel (Rx)
estrogens, conjugated (synthetic B) (Rx)
ethambutol (Rx)
everolimus (Rx)
exenatide (Rx)
efinaconazole topical
emedastine ophthalmic
emtricitabine/rilpivirine/tenofovir
enoxaparin (Rx)
enzalutamide
EPINEPHrine HCl
eplerenone (Rx)
eptifibatide (Rx)
erlotinib (Rx)
erythromycin ethylsuccinate (Rx)
erythromycin ophthalmic
eslicarbazepine
estradiol (Rx)
estradiol valerate (Rx)
estradiol vaginal tablet (Rx)
estrogens, conjugated, equine
eszopiclone (Rx)
etodolac (Rx)
evolocumab (Rx)
ezetimibe (Rx)

## famciclovir (Rx)

(fam-sye-klo'vir)
**Famvir**
*Func. class.:* Antiviral
*Chem. class.:* Guanosine nucleoside

**ACTION:** Inhibits DNA polymerase and viral DNA synthesis by conversion of this guanosine nucleoside to penciclovir

**Therapeutic outcome:** Decreasing size and number of lesions

**USES:** Treatment of acute herpes zoster (shingles), genital herpes, recurrent mucocutaneous herpes simplex virus (HSV) in HIV patients, initial episodes of herpes genitalis, herpes labialis in the immunocompromised

## CONTRAINDICATIONS

Hypersensitivity to this product, penciclovir, acyclovir, ganciclovir, valacyclovir, or valganciclovir

**Precautions:** Pregnancy, breastfeeding, renal disease, lactose intolerance

## DOSAGE AND ROUTES

### Herpes zoster

**Adult:** PO 500 mg q8hr × 7 days

### Renal dose

**Adult:** PO; 40-59 ml/min 500 mg q12hr; 20-39 ml/min 500 mg q24hr; CCr <20 ml/min 250 mg q24hr

### Suppression of recurrent Herpes simplex virus, including recurrent herpes genitalis and herpes labialis

**Adult:** PO 250 mg q12hr up to 1 yr

**Renal impairment: Recurrent herpes labialis:** CCr 60 ml/min or greater, usual dose; CCr 40 to 59 ml/min, 750 mg as a single dose; CCr 20 to 39 ml/min, 500 mg as single dose; CCr less than 20 ml/min, 250 mg as a single dose; hemodialysis, 250 mg as a single dose after dialysis

**Renal impairment: Recurrent orolabial or genital herpes in HIV-infected patients:** CCr 40 ml/min or greater, usual dose; CCr 20 to 39 ml/min, 500 mg every 24 hr; CCr less than 20 l/min, 250 mg every 24 hr; hemodialysis, 250 mg after each dialysis

### Recurrent genital herpes

**Adult:** PO 1000 mg bid in a single dose

### Renal dose

**Adult:** PO CCr 40-59 ml/min 500 mg q12hr × 1 day; CCr 20-39 ml/min 500 mg as a single dose; CCr <20 ml/min 250 mg as a single dose

### Suppression of recurrent genital herpes

**Adult:** PO 250 mg bid for up to a year

### Renal dose

**Adult:** PO CCr 20-39 ml/min 125 mg q12hr; CCr <20 ml/min 125 mg q24hr

### Herpes genitalis initial episodes

**Adult:** PO 250 mg tid × 7-10 days

**Available forms:** Tabs 125, 250, 500 mg

### Implementation

- Give with or without meals; absorption does not appear to be lowered when taken with food
- Give within 72 hr of the appearance of rash in herpes zoster

## ADVERSE EFFECTS

**CNS:** *Headache, fatigue, dizziness,* paresthesia, somnolence, fever
**GI:** Nausea, vomiting, diarrhea, constipation, abdominal pain, anorexia
**GU:** Decreased sperm count
**INTEG:** *Pruritus*
**MS:** Back pain, arthralgia
**RESP:** Pharyngitis, sinusitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed, 77% |
| **Distribution** | Protein binding 20% |
| **Metabolism** | Intestinal tissue, blood, liver |
| **Excretion** | Breast milk, kidney, bile |
| **Half-life** | Terminal 2-3 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1 hr |
| **Duration** | 12 hrs |

## INTERACTIONS

### Individual drugs

Probenecid: increased effect of famciclovir
Zoster vaccine: decreased effect of vaccine, varicella virus

## NURSING CONSIDERATIONS

### Assessment

- **Herpes zoster:** assess number and distribution of lesions; also burning, itching, or pain (early symptoms of herpes infection); neuralgia during, after treatment; monitor for postherpetic neuralgia
- **Acute renal failure:** usually in high doses or in those >65 yr; monitor renal function tests: urine CCr, BUN before, during treatment if patient has decreased renal function; dosage may need to be lowered; hepatic studies: LFTs

- Monitor bowel pattern before, during treatment; diarrhea may occur
- Assess for posttherapeutic neuralgia during and after treatment
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, enroll pregnant patient in Fanvir Pregnancy Registry 888-689-6682, use if potential benefits to the mother outweigh risks to the infant

### Patient/family education

- Teach patient how to recognize signs of beginning of infection (pain, itching, tingling); use product within 48 hr of rash
- Teach patient how to prevent the spread of infection to others, that until crusting of lesions has taken place, not to be around those who have not had the chicken pox vaccine or those who are immunocompromised, that product must be taken for whole course of treatment
- Teach patient reason for medication and expected results
- Teach patient to avoid driving or other hazardous activities until results are known, dizziness may occur
- Advise patient that this medication does not prevent spread of disease to others, that condoms should be used
- Advise women with genital herpes to have yearly Pap smears; cervical cancer is more likely

### Evaluation

**Positive therapeutic outcome**

- Decreased size and spread of lesions
- Prevention of recurrence (genital herpes)
- Decreased time for healing

## famotidine (Rx, OTC)

(fa-moe'ti-deen)

**Acid Control, Pepcid, Pepcid AC, Peptic Guard, Ulcidine**

*Func. class.:* $H_2$-histamine receptor antagonist, antiulcer agent

**ACTION:** Inhibits histamine at $H_2$-receptor site in gastric parietal cells, which inhibits gastric acid secretion while pepsin remains at a stable level

**Therapeutic outcome:** Healing of duodenal ulcers or gastric ulcers; prevention of duodenal ulcers; decreases symptoms of gastroesophageal reflux disease or Zollinger-Ellison syndrome, heartburn

**USES:** Short-term treatment of duodenal ulcer, maintenance therapy for duodenal ulcer, Zollinger-Ellison syndrome, multiple endocrine adenomas, gastric ulcers, heartburn, gastroesophageal reflux disease

**Unlabeled uses:** GI disorders in those taking NSAIDs, urticaria, prevention of stress ulcers, aspiration pneumonitis, prevention of paclitaxel hypersensitivity reactions

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children <12 yr, geriatric, severe renal/hepatic disease

## DOSAGE AND ROUTES

### Short-term treatment of gastric ulcer

**Adult:** PO 40 mg/day at bedtime × 4-8 wk, then 20 mg/day at bedtime if needed (maintenance); **IV** 20 mg q12hr if unable to take PO

**Child 1-16 yr:** PO 0.5 mg/kg/day at bedtime or divided bid, max 40 mg/day; IV 1-2 mg/kg/day in 1-2 divided doses

### Short-term treatment of duodenal ulcer

**Adult:** PO 40 mg at bedtime or 20 mg bid, maintenance 20 mg qday at bedtime

### Pathologic hypersecretory conditions

**Adult:** PO 20 mg q6hr; may give up to 160 mg q6hr if needed; **IV** 20 mg q12hr if unable to take PO

**Child 1-16 yr:** PO 1 mg/kg/day in two divided doses, max 40 mg bid

**Child 3 mo to <1 yr:** PO 0.5 mg/kg/dose bid ≤ 8 wk; child <30 mo: PO 0.5 mg/kg/dose qday, ≤8 wk

### GERD

**Adult:** PO 20 mg bid ≤ 6 wk; 40 mg bid ≤ 2 wk (ulcerative esophagitis)

### Heartburn relief/prevention

**Adult:** PO 10 mg with water, 15 min-1 hr before eating

### Renal dose

**Adult:** PO CCr <50 ml/min; give 50% of dose or extend interval to q36-48hr

### Stress ulcer prevention (ICU, head/thermal injury patients)

**Adult:** PO 20 mg by NG tube, IV 20 mg bid, cont IV inf 1.7 mg/hr

**Available forms:** Tabs 10, 20, 40 mg; powder for oral susp 40 mg/5 ml; inj 0.4 mg/ml premixed in normal saline, 10 mg/ml, 20 mg/50 ml 0.9% NaCl; orally disintegrating tabs (RPD) 20, 40 mg; chew tabs 10 mg

### Implementation

**PO route**

- Administer oral susp after shaking well; discard unused sol after 1 mo
- Store in cool environment (oral)

**Direct IV route**
- Give **IV** direct after diluting 2 ml of product (10 mg/ml) in 0.9% NaCl to total volume of 5-10 ml; inject over 2 min to prevent hypotension

**Intermittent IV infusion route**
- Administer after diluting 20 mg of product in 100 ml of LR, 0.9% NaCl, $D_5W$, $D_{10}W$; run over 15-30 min

**Continuous IV infusion route**
- **Adults:** Dilute 40 mg/250 ml $D_5W$ or NS, infuse over 24 hr, run at 11 ml/hr, use infusion device
- Store in cool environment (oral); **IV** sol is stable for 48 hr at room temperature; do not use discolored sol

**Y-site compatibilities:** Acyclovir, allopurinol, amifostine, aminophylline, amphotericin, ampicillin, ampicillin/sulbactam, inamrinone, amsacrine, atropine, aztreonam, bretylium, calcium gluconate, ceFAZolin, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, ceftAZidime, ceftizoxime, cefTRIAXone, cefuroxime, cephalothin, cephapirin, chlorproMAZINE, CISplatin, cladribine, cyclophosphamide, cytarabine, dexamethasone, dextran 40, digoxin, diphenhydrAMINE, DOBUTamine, DOPamine, DOXOrubicin, droperidol, enalaprilat, EPINEPHrine, erythromycin lactobionate, esmolol, filgrastim, fluconazole, fludarabine, folic acid, gentamicin, granisetron, haloperidol, heparin, hydrocortisone, HYDROmorphone, hydrOXYzine, imipenem/cilastatin, regular insulin, isoproterenol, labetalol, lidocaine, LORazepam, magnesium sulfate, melphalan, meperidine, methotrexate, methylPREDNISolone, metoclopramide, mezlocillin, midazolam, morphine, nafcillin, nitroglycerin, nitroprusside, norepinephrine, ondansetron, oxacillin, PACLitaxel, perphenazine, phenylephrine, phenytoin, phytonadione, piperacillin, potassium chloride, potassium phosphate, procainamide, propofol, sargramostim, sodium bicarbonate, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, verapamil, vinorelbine

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness,* paresthesia, depression, anxiety, somnolence, insomnia, fever, seizures in renal disease
**CV:** Dysrhythmias, QT prolongation (impaired renal functioning)
**EENT:** Taste change, tinnitus, orbital edema
**GI:** *Constipation,* nausea, vomiting, anorexia, cramps, abnormal liver enzymes, diarrhea
**HEMA:** Thrombocytopenia, aplastic anemia
**INTEG:** Rash, toxic epidermal necrolysis, Stevens-Johnson syndrome
**MS:** Myalgia, arthralgia
**RESP:** Pneumonia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 50% absorbed (PO) |
| **Distribution** | Plasma, protein binding (15%-20%) |
| **Metabolism** | Liver (30% active metabolizing) |
| **Excretion** | Kidneys (70%) |
| **Half-life** | 2½-3½ hr |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | 60 min | Immediate |
| **Peak** | 1-3 hr | 1-4 hr |
| **Duration** | 12 hr | 12 hr |

F

## INTERACTIONS

### Individual drugs

Cefditoren, cefpodoxime, itraconazole, ketoconazole: decreased absorption of each specific product
Atazanivir, delavirdine: decreased effects of each specific product

### Drug classifications

Antacids: decreased absorption of famotidine

## NURSING CONSIDERATIONS

### Assessment

- **Assess patient with ulcers or suspected ulcers:** epigastric, abdominal pain, hematemesis, occult blood in stools, blood in gastric aspirate before treatment; throughout treatment, monitor gastric pH (maintain at pH 5)
- **Renal function:** Patients with decreased renal function are at risk for prolonged QT
- **Beers:** Avoid in older adults with or at high risk of delirium, may induce or worsen delirium, assess for confusion, healing of duodenal ulcers, decreased gastroesophageal reflux
- **Pregnancy/breastfeeding:** Use cautiously in pregnancy, breastfeeding
- Monitor I&O ratio, BUN, creatinine, CBC with differential monthly

### Patient/family education

- Caution patient to avoid driving, other hazardous activities until stabilized on this medication; dizziness may occur
- Advise patient to avoid black pepper, caffeine, alcohol, harsh spices, NSAIDs, extremes in temperature of food; tell patient to avoid OTC preparations: aspirin, cough/cold preparations; condition may worsen
- Advise patient to avoid taking OTC and prescription preparations of this product concurrently, do not take for extended periods, risk of $B_{12}$ malabsorption

• Tell patient that smoking decreases the effectiveness of the product; that smoking cessation should be considered
• Instruct patient that product must be continued for prescribed time to be effective and taken exactly as prescribed; doses are not to be doubled; take missed dose when remembered up to 1 hr before next dose
• Tell patient to report diarrhea, black tarry stools, sore throat, rash, dizziness, confusion, or delirium to prescriber immediately

### Evaluation

**Positive therapeutic outcome**
• Decreased pain in abdomen
• Healing of ulcers, decreased gastroesophageal reflux

## febuxostat (Rx)

(feb-ux′oh-stat)
**Uloric**
*Func. class.:* Antigout drug, antihyperuricemic
*Chem. class.:* Xanthine oxidase inhibitor

**ACTION:** Inhibits the enzyme xanthine oxidase, reducing uric acid synthesis; more selective for xanthine oxidase than allopurinol

**Therapeutic outcome:** Decreased signs/symptoms of gout, hyperuricemia

**USES:** Chronic gout, hyperuricemia

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, renal/hepatic/cardiac/neoplastic disease, stroke, MI, organ transplant, Lesch-Nyhan syndrome

## DOSAGE AND ROUTES

**Adult:** PO 40 mg daily, may increase to 80 mg daily if uric acid levels are >6 mg/dl after 2 wk of therapy

**Available forms:** Tabs 40, 80 mg

### Implementation

**PO route**
• Give without regard to meals or antacid; may crush and add to foods or fluids

## ADVERSE EFFECTS

**CNS:** Dizziness
**CV:** MI, atrial fibrillation, atrial flutter, AV block, bradycardia, hyper/hypotension, palpitations, sinus tachycardia, stroke, angina
**GI:** *Nausea*
**GU:** Renal failure, urinary urgency/frequency/incontinence, nephrolithiasis, hematuria
**INTEG:** Rash
**MISC:** Arthralgia, gout flare

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 99.2%, max lowering of uric acid 2 wk |
| **Metabolism** | Unknown |
| **Excretion** | Feces, urine |
| **Half-life** | 5-8 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-1.5 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

AzaTHIOprine, didanosine, mercaptopurine: do not use together increased toxicity
Rasburicase: increased xanthine nephropathy, calculi

### Drug classifications

Antineoplastics: increased xanthine nephropathy, calculi
Increase: Effect of theophylline

### Drug/lab

Increase: LFTs, alkaline phosphatase, serum cholesterol, triglycerides, amylase, BUN, creatinine, aPTT, PT, CPK, creatine
Decrease: Hct/Hgb, RBC, platelets, lymphocytes, neutrophils, TSH, blood glucose

## NURSING CONSIDERATIONS

### Assessment

• **Hyperuricemia:** Monitor uric acid levels q2wk; uric acid levels should be 6 mg/dl or less
• Hepatic studies prior to use, then at 2, 4 mo, and then periodically; assess for fatigue, anorexia, right upper abdominal discomfort, dark urine, jaundice
• **Renal disease:** Monitor I&O ratio; increase fluids to 2 L/day to prevent stone formation and toxicity
• Assess for rash, hypersensitivity reactions; discontinue
• **Assess for gout:** joint pain, swelling; may use with NSAIDs for acute gouty attacks and gout flare (first 6 wk)
• **Pregnancy/breastfeeding:** It is unknown if product crosses the placenta or appears in breast milk, use only if benefit outweighs risk

### Patient/family education

- Inform patient that tabs may be crushed
- Teach patient to take as prescribed; if dose is missed, take as soon as remembered; do not double dose
- Teach patient to increase fluid intake to 2 L/day unless contraindicated
- Advise patient to avoid alcohol, caffeine; will increase uric acid levels
- Advise patient to report cardiovascular events to prescriber, immediately (chest pain, dyspnea, slurred speech, weakness)
- **Gout:** teach patient that flares may occur during first 6 wk of treatment, continue and notify prescriber

### Evaluation

**Positive therapeutic outcome**

- Decreased pain in joints, decreased stone formation in kidneys, decreased uric acid levels

## felodipine (Rx)

(feh-loh'dih-peen)
**Renedil**
*Func. class.:* Calcium-channel blocker, antihypertensive, antianginal
*Chem. class.:* Dihydropyridine

**ACTION:** Inhibits calcium ion influx across cell membrane, resulting in inhibition of excitation/contraction of vascular smooth muscle

**Therapeutic outcome:** Decreased B/P in hypertension

**USES:** Essential hypertension, alone or with other antihypertensives

## CONTRAINDICATIONS

Hypersensitivity to this product or dihydropyridines, sick sinus syndrome, 2nd- or 3rd-degree heart block, hypotension <90 mm Hg systolic

**Precautions:** Pregnancy, breastfeeding, children, geriatric, HF, hepatic injury, renal disease, coronary artery disease

## DOSAGE AND ROUTES

**Adult:** Hypertension PO 5 mg/day initially, usual range 2.5-10 mg/day; max 10 mg/day; do not adjust dosage at intervals of <2 wk
**Geriatric:** PO 2.5 mg/day, max 10 mg/day

### Hepatic dose

**Adult:** PO 2.5-5 mg/day, max 10 mg/day

**Available forms:** Ext rel tabs 2.5, 5, 10 mg

### Implementation

**PO route**

- Do not break, crush, or chew ext rel tabs
- Give once a day with food for GI symptoms

## ADVERSE EFFECTS

**CNS:** *Headache,* fatigue, drowsiness, dizziness, anxiety, depression, nervousness, insomnia, light-headedness, paresthesia, tinnitus, psychosis, somnolence
**CV:** Dysrhythmias, *edema,* HF, hypotension, palpitations, MI, pulmonary edema, tachycardia, syncope, AV block, angina
**GI:** Nausea, vomiting, diarrhea, gastric upset, constipation, dry mouth
**GU:** Nocturia, polyuria, sexual dysfunction, decreased libido
**HEMA:** Anemia
**INTEG:** Rash, pruritus, peripheral edema
**MISC:** Flushing, sexual difficulties, cough, nasal congestion, shortness of breath, wheezing, epistaxis, respiratory infection, chest pain, angioedema, gingival hyperplasia, Stevens-Johnson syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Unknown; protein binding >99% |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys |
| **Half-life** | 11-16 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 1 hr |
| **Peak** | 2½-5 hr |
| **Duration** | <24 hr |

## INTERACTIONS

### Individual drugs

Alcohol, carBAMazepine, cimetidine, clarithromycin, conivaptan, cycloSPORINE, dalfopristin, delavirdine, dilTIAZem, erythromycin, itraconazole, ketoconazole, miconazole, phenytoin, propanolol, quiNIDine, quinupristin, zileuton: increased hypotension
Digoxin, disopyramide, phenytoin: increased bradycardia, increased HF

### Drug classifications

β-Adrenergic blockers: increased bradycardia, HF
Nitrates: increased hypotension
NSAIDs: decreased antihypertensive effects

### Drug/herb

Ginkgo, ginseng, hawthorn: increased antihypertensive effect
Ephedra, St. John's wort: decreased antihypertensive effect

### Drug/food

Grapefruit juice: increased felodipine level

## NURSING CONSIDERATIONS

### Assessment

- **HF:** Assess fluid volume status: I&O ratio and record; weight; skin turgor; adequacy of pulses; moist mucous membranes; bilateral lung sounds; peripheral pitting edema; dehydration symptoms of decreasing output, thirst, hypotension, dry mouth, and mucous membranes should be reported; for HF: weight gain, crackles, dyspnea, edema, jugular venous distention
- Monitor ALT, AST, bilirubin daily if these are elevated
- Monitor cardiac status: B/P, pulse, respiration, ECG, periodically during prolonged treatment
- **Assess for anginal pain:** duration; intensity; ameliorating, aggravating factors; **Hypertension:** Check for compliance, number of refills
- **Pregnancy/breastfeeding:** Fetal anomalies have occurred, avoid use in pregnancy, do not breastfeed

### Patient/family education

- Caution patient to avoid hazardous activities until stabilized on product and dizziness is no longer a problem
- Instruct patient to limit caffeine consumption; to avoid alcohol and OTC products unless directed by prescriber
- **Urge patient to comply in all areas of medical regimen:** diet, exercise, stress reduction, product therapy; to notify prescriber of irregular heartbeat, shortness of breath, swelling of feet and hands, pronounced dizziness, constipation, nausea, hypotension
- Advise patient to use protective clothing, sunscreen to prevent photosensitivity
- Teach patient to change positions slowly to prevent orthostatic hypotension
- Advise patient to obtain correct pulse; to contact prescriber if pulse is <50 bpm
- Teach patient to use as directed even if feeling better; may be taken with other CV products (nitrates, β-blockers); that capsules may appear in stools but are insignificant
- Teach patient to practice good oral hygiene to prevent gingival hyperplasia
- Advise patient not to stop medication abruptly
- Advise patient to avoid grapefruit juice

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P
- Decreased anginal attacks
- Increase in activity tolerance

## fenofibrate (Rx)

(fen-oh-fee'brate)

**Antara, Lipidil EZ, Lipidil, Lipidil Supra, Lipofem, Lofibra, Tricor, Triglide**

*Func. class.:* Antilipemic

*Chem. class.:* Fibric acid derivative

**Do not confuse:** Tricor/Tracleer

**ACTION:** Increases lipolysis and elimination of triglyceride-rich particles from plasma by activating lipoprotein lipase, resulting in triglyceride change in size and composition of LDL, leading to rapid breakdown of LDL; mobilizes triglycerides from tissue; increases excretion of neutral sterols

**Therapeutic outcome:** Decreasing cholesterol levels and low-density lipoproteins, decreased pruritus

**USES:** Hypercholesterolemia, patients with types IV, V hyperlipidemia who do not respond to other treatment and who are at risk for pancreatitis; Fredrickson type IV, V hypertriglyceridemia

## CONTRAINDICATIONS

Hypersensitivity, severe renal/hepatic disease, primary biliary cirrhosis, preexisting gallbladder disease, breastfeeding

**Precautions:** Pregnancy, geriatric, peptic ulcer, pancreatitis, renal/hepatic disease, diabetes mellitus

## DOSAGE AND ROUTES

### Hypertriglyceridemia

**Adult:** PO (Antara) 30-90 mg/day; (Fenoglide) 40-120 mg/day; (Lofibra) 67-200 mg/day; (Tricor) 48-145 mg/day; (Triglide) 50-160 mg/day; Lipofen) 50 mg qday

### Primary hypercholesterolemia/mixed hyperlipidemia

**Adult:** PO (Antara) 90 mg/day; (Lofibra) 200 mg/day; (Tricor) 145 mg/day; (Triglide) 160 mg/day; (Lipofen) 50 mg/day

### Renal dose (geriatric)

**Adult:** PO (Tricor) CCr 30-80 ml/min 48 mg/day; CCr <30 ml/min contraindicated

**Adult:** PO (Triglide, Lipofem) CCr 11-49 ml/min 50 mg/day; (Antara) 30 mg/day; (Fenoglide) 40 mg/day; (Lofibra) 67 mg/day; (Antara, Lipofem, Lofibra, Triglide) CCr <30 ml/min, contraindicated

**Available forms:** Cap: **Antara** 30, 90 mg; **Lipofen** 50, 150 mg tab: **Triglide** 50, 160 mg;

**Lofibra** 54, 160 mg; **Tricor** 48, 145 mg; **Fenoglide** 40, 120 mg

### Implementation

- Do not break, crush, or chew tabs
- Give with evening meal; if dose is increased, give with breakfast and evening meal (Lipofen, Lofibra); Triglide, Antara without regard to food; may increase q4-8wk
- Brands are not interchangeable; therapy should be discontinued if there is not adequate response after 2 mo
- Store in cool environment in tight, light-resistant container
- Caps must be swallowed whole
- Protect Lipofen, Triglide, from light, moisture

## ADVERSE EFFECTS

**CNS:** **Fatigue**, headache, paresthesia, drowsiness, **dizziness**
**CV:** Angina, **hypertension**, hypotension
**GI:** Nausea, **vomiting**, **dyspepsia**, **flatulence**, **hepatomegaly**, **gastritis**, pancreatitis, cholelithiasis
**GU:** diarrhea, constipation
**HEMA:** Anemia, leukopenia, thrombosis, pulmonary embolism
**INTEG:** ***Rash***, **pruritus**
**MS:** **Myalgias, arthralgias,** myopathy, rhabdomyolysis
**RESP:** Pharyngitis, bronchitis, cough

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 99% |
| **Metabolism** | Liver |
| **Excretion** | Urine 60%, feces 25% |
| **Half-life** | 20 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 6-8 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

CycloSPORINE: increased nephrotoxicity

### Drug classifications

Anticoagulants (oral): increased effect of anticoagulants
Bile acid sequestrants: decreased absorption
HMG-CoA reductase inhibitors: do not use together, rhabdomyolysis may occur

### Drug/herb

Red yeast rice: increased effects

### Drug/food

Increased absorption

### Drug/lab test

Increase: ALT, AST, BUN, CK, creatinine
Decrease: WBC, uric acid, Hgb

## NURSING CONSIDERATIONS

### Assessment

- **Hypercholesterolemia:** Hyperlipidemia: Diet history, monitor lipid levels (triglycerides, LDL, HDL, total cholesterol), fat content
- Liver function tests, baseline and periodically during treatment; if >3 × ULN, discontinue CPK if muscle pain occurs, CBC, Hct, Hgh, protime with anticoagulant therapy, serum bilirubin (total and direct)
- Assess for pancreatitis, cholelithiasis, renal failure, rhabdomyolysis (when combined with HMG-CoA reductase inhibitors), myositis; product should be discontinued; Assess often for muscle pain, weakness, fever
- Assess nutrition: Obtain fat, protein, carbohydrates, nutritional analysis should be completed by dietitian
- **Pregnancy/breastfeeding:** Avoid in pregnancy unless benefits outweigh risk to the fetus, do not breastfeed

### Patient/family education

- Inform patient that compliance is needed
- Instruct patient not to consume chipped or broken tabs (Triglide)
- Teach patient that risk factors—high-fat diet, smoking, alcohol consumption, absence of exercise—should be decreased
- Caution patient to notify prescriber if pregnancy is planned or suspected, not to breastfeed
- Teach patient to notify prescriber if the GI symptoms of diarrhea, abdominal or epigastric pain, nausea, or vomiting occur
- Advise patient to notify prescriber of muscle pain, weakness, fever, fatigue, epigastric pain

### Evaluation

#### Positive therapeutic outcome

- Decrease in cholesterol to desired level after 8 wk

**⚠ HIGH ALERT**

# fentaNYL (Rx)

(fen'ta-nill)

**RAN-Fentanyl, Sublimaze**

# fentaNYL transdermal (Rx)

**Duragesic, Ionsys**

*Func. class.:* Opioid analgesic

*Chem. class.:* Synthetic phenylpiperidine derivative

# fentaNYL nasal spray (Rx)

**Lazanda**

# fentaNYL SL spray (Rx)

**Subsys**

# fentaNYL SL

**Abstral**

# fentaNYL buccal

**Fentora**

# fentaNYL lozenge

**Actiq**

**Controlled substance schedule II**

**Do not confuse:** fentaNYL/SUFentanil

**ACTION:** Inhibits ascending pain pathways in CNS, increases pain threshold, alters pain perception by binding to opiate receptors

**Therapeutic outcome:** Relief of pain, supplement to anesthesia

**USES:** Controls moderate to severe pain; preoperatively, postoperatively; adjunct to general anesthetic, adjunct to regional anesthesia; **FentaNYL:** for anesthesia as premedication, conscious sedation; **Actiq:** for breakthrough cancer pain

## CONTRAINDICATIONS

Hypersensitivity to opiates, myasthenia gravis

**BLACK BOX WARNING:** headache, migraine (Actiq), Astral, Fentora, Lazanda, Onsolis, emergency dept use (Abstral, Lazanda), outpatient surgeries (Duragesic TD), opioid-naive patients, respiratory disorders, depression

**Precautions:** Pregnancy, breastfeeding, geriatric, increased ICP, seizure disorders, cardiac dysrhythmias, severe respiratory disorders

**BLACK BOX WARNING:** Children, accidental exposure, ambient temperature increase, fever, skin abrasion (TD patch), substance abuse, surgery, requires an experienced clinician

## DOSAGE AND ROUTES

### >> FentaNYL

**Anesthetic (adjust to regional anesthesia)**

**Adult: IV** 50-100 mcg/kg over 1-2 min, max 150 mcg/kg

**Anesthesia supplement to general anesthesia**

**Adult and child >12 yr:** Low dose 1-2 mg/kg; (IV) moderate dose 2-20 mcg/kg; High dose 20-50 mcg/kg, then 25 mcg to half initial loading dose as needed

**Induction and maintenance**

**Child 2-12 yr: IV** 2-3 mcg/kg

**Preoperatively**

**Adult and child >12 yr:** IM/**IV** 50-100 mcg q30-60 min before surgery

**Postoperatively**

**Adult and child >12 yr:** IM/**IV** 50-100 mcg q1-2hr prn

**Moderate/severe pain**

**Adult:** IV/IM 50-100 mcg q1-2hr

### >> Actiq

**Adult:** Transmucosal 200 mcg, redose if needed 15 min after completion of 1st dose, max 2 doses during titration period, max 4 doses/day

### >> Fentora

**Adult:** BUCCAL/SL 100 mcg placed above rear molar between upper cheek and gum, a second 100 mcg dose, if needed, may be started 30 min after first dose

### >> ABSTRAL

**Adult:** SL 100 mcg, another dose may be taken 30 min after first, max 2 doses per episode of breakthrough pain, ≥2 hr must elapse before treating again, titrate stepwise over consecutive episodes

### >> FentaNYL transdermal

**Adult: Duragesic:** 12.5-25 mcg/hr; may increase until pain relief occurs; apply patch to flat surface on upper torso and wear for 72 hr; apply new patch to different site for continued relief; **Ionsys:** Use only after patient has been titrated to acceptable level of analgesics, one dose activation = 40 mcg TD over 10 min, max 6 (40 mcg doses/hr)

### >> FentaNYL nasal spray

**Adult:** 100 mcg (1 spray in 1 nostril), may re-treat after ≥2 hr, titrate upward to adequate analgesia, treat a max of 4 episodes q day

### >> FentaNYL SL spray

**Adult:** SL 100 mcg sprayed under the tongue; titrate stepwise carefully

**Available forms:** Inj 0.05 mg/ml; lozenges 100, 200, 300, 400, 600, 800, 1200, 1600 mcg; lozenges on a stick 200, 400, 600, 800, 1200, 1600 mcg; buccal tab 100, 200, 400, 600, 800 mcg; transdermal patch 12, 25, 50, 75, 100 mcg/hr; SL tab (ABSTRAL) 100, 200, 300, 400, 600, 800 mcg; SL spray: 100, 200,400, 600, 1200, 1600 mcg/spray; nasal spray 100, 400 mcg/actuation

## Implementation

- Store in light-resistant area at room temperature
- Overdose has been fatal when confusing products/dose; recheck both before using

**Transmucosal route**

- Remove foil just before administration; instruct patient to place between cheek and lower gum, moving it back and forth and sucking, not chewing (Actiq); place above rear molar (Fentora); place film on the inside of the cheek (Onsolis); all products not used or partially used should be flushed down the toilet; this product may be used SL

**Transdermal route**

***Duragesic***

- Apply patch to chest on a flat area with skin intact; for skin preparation, use clear water with no soap; clip hair, skin should be dry before applying patch; apply immediately after removing from package and press firmly in place with palm of hand; flush old patch down toilet immediately upon removal

**Ionsys (iontophoretic transdermal system) route:**

- Apply only one system at any given time. Always wear gloves when handling
- Remove the foil pouch and the controller from the tray. Remove the drug unit from the foil pouch and place on a hard, flat surface
- Assemble the system. Align the matching shapes of the controller and the unit. Press on both ends of the device to ensure that the snaps at both ends are fully engaged. One or two clicks will be heard when the snaps are engaged
- The digital display of the controller will complete a short self-test during which there is one audible beep, the red light will blink once, and the digital display will flash the number 88. Then the display will show 0 and a green light will blink
- Choose an application site of healthy, unbroken skin on the upper outer arm or chest only. Clip excessive hair. Do not shave, as this may irritate the skin
- Clean the site with alcohol and let dry. Do not use soaps, lotions, or other agents
- Peel off and discard the clear plastic liner covering the adhesive and hydrogels. Do not pull the red tab while preparing to apply the system; the red tab is only to be used during disposal
- Press and hold the system in place for ≥ 15 sec with sticky side facing the skin. Make sure the edges adhere to the skin
- If the system loosens from the skin, secure it by pressing the edges or use a nonallergenic tape to secure the edges. Do not apply tape if skin is blistered or broken. Apply tape along the long edges of the system. Do not tape over the button, light, or digital display. After taping if the system beeps again, remove it and apply a new system on a different skin site
- To initiate administration of a dose, the patient should press the recessed button on the top housing of the system twice within 3 sec. A single beep indicates the start of dose delivery that occurs over 10 min. During this time the system is locked out and another dose cannot be delivered. When dose delivery is complete, the display will show the number of doses delivered
- Each system will function for 24 hr or 80 doses, whichever comes first. At this time, the green light will turn off and the number of doses delivered will flash on and off. To turn off the digital display, press the dosing button for 6 sec
- Remove the system from the patient's skin. Ensure both hydrogels (one contains fentanyl) remain within the removed system. If a hydrogel becomes separated during removal, use gloves or tweezers to remove it from the skin and properly dispose of in accordance with state and federal regulations for controlled substances
- Do not touch exposed hydrogel compartments or adhesive. If a hydrogel is touched accidentally, rinse the area with water. Do not use soap
- If additional analgesia is needed, a new system must be applied to a different site on the upper outer arm or chest
- *Disposal:* With gloves on, pull the red tab to separate the red bottom housing containing fentanyl from the system. Fold the red housing in half with the sticky side facing in. Dispose of the red housing per policies for disposal of schedule II drugs or by flushing it down the toilet. Hold the dosing button down until the display goes blank, and then dispose of the remaining part of the system containing electronics in waste designated for batteries

**Use pain dosing**

- Dosage is titrated based on patient's report of pain; dosage is determined by calculating the previous 24-hr requirement and converting to equianalgesic morphine dose
- To convert to another opioid analgesic, remove transdermal patch and begin treatment with half the equal pain-controlling dose of the new analgesic in 12-18 hr

**SL spray**

- Open blister package with scissors immediately prior to use; spray contents under tongue;

dispose of unit by placing it into disposable bags provided; seal bag, discard into trash container out of reach of children.

**IV route**
- Give by inj (IM, **IV**), only with resuscitative equipment available; give slowly to prevent rigidity
- Give **IV** undiluted by anesthesiologist or diluted with 5 ml or more sterile water or 0.9% NaCl given through Y-tube or 3-way stopcock given at 0.1 mg or less/1.2 min
- Muscular rigidity may occur with rapid IV administration

**Y-site compatibilities:** Abciximab, acyclovir, alemtuzumab, alfentanil, alprostadil, amikacin, aminocaproic acid, aminophylline, amiodarone, amphotericin B cholesteryl, amphotericin B lipid complex, amphotericin B liposome, anidulafungin, argatroban, ascorbic acid injection, atenolol, atracurium, atropine, azaTHIOprine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, ceFAZolin, cefmetazole, cefonicid, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, ceftobiprole, cefTRIAXone, cefuroxime, cephalothin, chloramphenicol, chlorproMAZINE, cimetidine, cisatracurium, CISplatin, clindamycin, cloNIDine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, digoxin, dilTIAZem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doripenem, doxacurium, doxapram, DOXOrubicin, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, epoetin alfa, eptifibatide, erythromycin, esmolol, etomidate, etoposide, famotidine, fenoldopam, fluconazole, fludarabine, fluorouracil, folic acid, furosemide, ganciclovir, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, inamrinone, insulin (regular), irinotecan, isoproterenol, ketorolac, labetalol, lansoprazole, levofloxacin, lidocaine, linezolid, LORazepam, LR, magnesium sulfate, mannitol, mechlorethamine, meperidine, metaraminol, methicillin, methotrexate, methotrimeprazine, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, mezlocillin, miconazole, midazolam, milrinone, minocycline, mitoXANTRONE, mivacurium, morphine, moxalactam, multiple vitamins injection, mycophenolate, nafcillin, nalbuphine, naloxone, nesiritide, netilmicin, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, papaverine, PEMEtrexed, penicillin G potassium/sodium, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phenylephrine, phytonadione, piperacillin, piperacillin-tazobactam, polymyxin B, potassium chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, pyridoxine, quiNIDine, quinupristin-dalfopristin, ranitidine, remifentanil, Ringer's, ritodrine, riTUXimab, rocuronium, sargramostim, scopolamine, sodium acetate/bicarbonate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiopental, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA, tobramycin, tolazoline, TPN, trastuzumab, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, vitamin B complex/C, voriconazole, zoledronic acid

## ADVERSE EFFECTS

**CNS:** Dizziness, delirium, euphoria, sedation, confusion, weakness, dizziness, seizures
**CV:** Bradycardia, cardiac arrest, hypo/hypertension, DVT, PE
**EENT:** Blurred vision, miosis
**GI:** Nausea, vomiting, constipation
**GU:** Urinary retention
**INTEG:** Rash, diaphoresis
**MS:** Muscle rigidity
**RESP:** Respiratory depression, arrest, laryngospasm

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (IM), completely absorbed (**IV**) |
| **Distribution** | Unknown, crosses placenta |
| **Metabolism** | Extensively, liver; 80% bound to plasma proteins |
| **Excretion** | Kidneys, up to 25% unchanged; breast milk |
| **Half-life** | IV 2-4 hr; transdermal 13-22 hr; transmucosal 7 hr; buccal 4-12 hr |

### Pharmacodynamics

| | IM | IV | TD | TM |
|---|---|---|---|---|
| **Onset** | 7-15 min | Rapid | 6 hr | 5-15 min |
| **Peak** | 30 min | 3-5 min | 12-24 hr | 30 min |
| **Duration** | 1-2 hr | ½-1 hr | 72 hr | |

| | Intranasal | TD | Transmucosal |
|---|---|---|---|
| **Onset** | 15-20 min | 12-24 hr, | 5-15 min |
| **Peak** | 25-30 min | 1-3 days, | 30 min |

## INTERACTIONS

### Individual drugs

Alcohol: increased respiratory depression, hypotension, increased sedation

**BLACK BOX WARNING:** Cimetidine, conivaptan, cycloSPORINE, fluconazole, itraconazole, ketoconazole, nefazodone, ranolazine, zafirlukast, zileuton: increased fentaNYL effect, fatal respiratory depression, CYP3A4 inhibitors

diazePAM: increased CV depression
Droperidol: increased hypotension

### Drug classifications

Antipsychotics, opioids, skeletal muscle relaxants: effects increased, protease inhibitors
CNS depressants, sedative/hypnotics: increased respiratory depression, hypotension
CYP3A4 inducers (carBAMazepine, PHENobarbital, phenytoin, rifampin): decreased fentaNYL effect
MAOIs: increased fatal reactions

### Drug/herb

St. John's wort, valerian: increased fentaNYL action
Echinacea: decreased effect of fentaNYL

### Drug/lab test

Increased: amylase, lipase

## NURSING CONSIDERATIONS

### Assessment

- Monitor VS after parenteral route (B/P, pulse, respiration); note muscle rigidity; take drug history before administering product; check renal/liver function tests

**BLACK BOX WARNING:** Respiratory depression: Monitor character, rate, rhythm; notify prescriber if respirations <10/min

- Monitor CNS changes: dizziness, drowsiness, hallucinations, euphoria, LOC, pupil reaction
- Monitor allergic reactions: rash, urticaria; product should be discontinued
- **Assess for pain:** intensity, location, duration, type, before and 15 min after IM route or 3-5 min after **IV** route

**BLACK BOX WARNING: Headache, migraine:** Abstral, Actiq, Fentora, Lazanda, Onsolis are not to be used for this condition; Abstral, Lazanda is not to be used in the ED; Duragesic TD is not to be used for outpatient surgery patients

**BLACK BOX WARNING: Apnea, respiratory arrest in opioid-naive patients:** Do not use Abstral, Actiq, Duragesic, Fentora, Lazanda, Onsolis, opioid tolerant are those using ≥60 ml/day oral morphine, ≥30 mg/day oxyCODONE PO, 8 mg/day HYDROmorphone, 25 mcg tid fentaNYL/hr

- **Pregnancy/breastfeeding:** Use in pregnancy only if potential benefit outweighs risks, not recommended in breastfeeding
- **Beers:** Avoid in older adults unless safer alternative is not available, may cause ataxia, impaired psychomotor function

### Patient/family education

- Discuss the dangers of children or pets getting the product
- Advise patient to report any symptoms of CNS changes, allergic reactions
- Instruct patient to avoid CNS depressants: alcohol, sedative-hypnotics for at least 24 hr after taking this product
- Teach patient that dizziness, drowsiness, confusion are common, and to avoid getting up without assistance
- Discuss in detail with patient all aspects of the product
- Teach patient CNS changes: physical dependence; not to use with alcohol, other CNS depressants

**Transdermal route**

**BLACK BOX WARNING: Ambient temperature increase:** Discuss with patient that excessive heat may increase absorption; excessive perspiration may alter adhesiveness; do not use with heating pads, electric blankets, heat/tanning lamps, saunas, hot tubs, heated waterbeds, sunbathing

- Discuss with patient that hair may need to be clipped before applying
- Teach patient how to dispose of patch: place sticky sides together and flush in toilet
- May add first aid tape around the edges if there is a problem with adhesion

### Evaluation

**Positive therapeutic outcome**

- Maintenance of anesthesia
- Decreased breakthrough cancer pain
- General pain relief

## TREATMENT OF OVERDOSE:

Naloxone 0.2-0.8 **IV**, $O_2$, **IV** fluids, vasopressors

## ferrous fumarate (Rx)
**Femiron, Feostat, Ferrate, Ferretts, Ferrocite, Hemocyte, Palafer**
## ferrous gluconate (Rx)
**Fergon**
## ferrous sulfate (Rx)
**Feosol, Fer-Gen-Sol, Fer-In-Sol, FeroSul**
## carbonyl iron (OTC)
(kar′boh-nil)
**ICAR Pediatric, Iron Chews**
## iron polysaccharide (OTC)
**iFerex, Niferex, Nu-Iron**

*Func. class.:* Hematinic
*Chem. class.:* Iron preparation

**ACTION:** Replaces iron stores needed for red blood cell development, energy and $O_2$ transport, utilization; fumarate contains 33% elemental iron; gluconate, 12%; sulfate, 20%; iron, 30%; ferrous sulfate exsiccated

**Therapeutic outcome:** Prevention and correction of iron deficiency

**USES:** Iron deficiency anemia, prophylaxis for iron deficiency in pregnancy, nutritional supplementation

## CONTRAINDICATIONS
Sideroblastic anemia, thalassemia, hemosiderosis/hemochromatosis

**Precautions:** Pregnancy; anemia (long-term), peptic ulcer disease, hemolytic anemia, cirrhosis, ulcerative colitis/regional enteritis, sulfite sensitivity

**BLACK BOX WARNING:** Accidental exposure

## DOSAGE AND ROUTES
### Fumarate
**Adult:** PO 50-100 mg tid
**Child:** PO 3 mg/kg/day (elemental iron) tid-qid
**Infant:** PO 10-25 mg/day (elemental iron) in 3-4 divided doses, max 15 mg/day

### Gluconate
**Adult:** PO 60 mg bid-qid
**Child 6-12 yr:** PO 3 mg/kg/day divided

### Sulfate
**Adult:** PO 0.750-1.5 g/day in divided doses tid
**Child 6-12 yr:** 600 mg/day in divided doses

### Pregnancy
**Adult:** PO 300-600 mg/day in divided doses

### Iron polysaccharide
**Adult:** 100-200 mg tid
**Child:** PO 4-6 mg/kg/day in 3 divided doses (severe iron deficiency)

**Available forms:** **Fumarate:** tabs 90, 150, 200, 300, 324, 325 mg; chewable tabs 100 mg; extended release tabs 18 mg; **gluconate:** tabs 225, 240, 324, 325 mg; **sulfate:** tabs 195, 300, 325 mg; elixir 220 mg/5 ml; dried: tabs 200 mg; ext rel tabs 160 mg; ext rel caps 160 mg; **iron polysaccharide:** tabs 50 mg; caps 150 mg; sol 100 mg/5 ml

### Implementation
**PO route**
- Swallow all tabs whole; do not break, crush, or chew
- Give between meals for best absorption; may give with juice; do not give with antacids or milk, delay at least 1 hr; if GI symptoms occur, give after meals even if absorption is decreased; eggs, milk products, chocolate, caffeine interfere with absorption; ferrous gluconate is less GI irritating than ferrous sulfate
- Give **liquid** preparations through plastic straw to avoid discoloration of tooth enamel; dilute thoroughly
- Store in tight, light-resistant container
- Give at least 1 hr before bedtime because corrosion may occur in stomach
- Give for <6 mo for anemia
- Store at room temperature; protect from moisture

## ADVERSE EFFECTS
**GI:** *Nausea, constipation, epigastric pain, black and red tarry stools,* vomiting, diarrhea
**INTEG:** Temporarily discolored tooth enamel and eyes
**SYST:** Hypersensitivity reactions (Ferrlecit)

### Pharmacokinetics
| | |
|---|---|
| **Absorption** | Up to 30% |
| **Distribution** | Bound to transferrin, crosses placenta |
| **Metabolism** | Recycled |
| **Excretion** | Feces, urine, skin, breast milk |
| **Half-life** | Unknown |

### Pharmacodynamics
Unknown

## INTERACTIONS
### Individual drugs
Chloramphenicol, vit C: increased absorption of iron products
Cholestyramine, L-thyroxine, levodopa, methyldopa, penicillamine, tetracycline, vitamin E: decreased absorption of each product

### Drug classifications
Antacids, $H_2$ antagonists, proton pump inhibitors: decreased absorption of iron preparations
Fluoroquinolones: decreased absorption of fluoroquinolone

### Drug/food
Caffeine, dairy products, eggs: decreased absorption

### Drug/lab test
False positive: occult blood

## NURSING CONSIDERATIONS
### Assessment
- Monitor blood studies: Hct, Hgb, reticulocytes, bilirubin before treatment, at least monthly; iron studies (Fe, TIBC, ferritin), avoid use with blood transfusions, iron overload may occur
- **Assess for toxicity:** nausea, vomiting, diarrhea (green, then tarry stools) hematemesis, pallor, cyanosis, shock, coma
- Assess bowel elimination; if constipation occurs, increase water, bulk, activity before laxatives are required
- **Assess nutrition:** amount of iron in diet (meat, dark green leafy vegetables, dried beans, dried fruits, eggs); provide referral to dietitian if indicated
- **Pregnancy/breastfeeding:** Use in pregnancy only if benefit outweighs fetal risks to fetus, excreted in breast milk, avoid use
- Identify cause of iron loss or anemia, including salicylates, sulfonamides, antimalarials, quiNIDine

### Patient/family education
- Advise patient that iron will make stools black or dark green, stain teeth; that iron poisoning may occur if increased beyond recommended level
- **Accidental exposure:** advise patient to keep out of reach of children, pets
- Caution patient not to substitute one iron salt for another; elemental iron content differs (e.g., 300 mg ferrous fumarate contains about 100 mg elemental iron, whereas 300 mg ferrous gluconate contains only about 30 mg elemental iron)
- Caution patient to avoid reclining position for 15-30 min after taking product to avoid esophageal corrosion; to follow diet high in iron
- Caution patient to avoid taking iron, dairy products, calcium supplements, vit C together; they compete for absorption

### Evaluation
**Positive therapeutic outcome**
- Decreased fatigue, weakness
- Improvement in Hct, Hgb, reticulocytes

## TREATMENT OF OVERDOSE:
Induce vomiting; give eggs, milk until lavage can be done

## fesoterodine (Rx)
(fess′oh-ter-oh-deen)
**Toviaz**
*Func. class.:* Overactive bladder product
*Chem. class.:* Muscarinic receptor antagonist

F

## ACTION:
Relaxes smooth muscles in urinary tract by inhibiting acetylcholine at postganglionic sites

**Therapeutic outcome:** Absence of urinary frequency, urgency, incontinence

## USES:
Overactive bladder (urinary frequency, urgency), urinary incontinence

## CONTRAINDICATIONS
GI obstruction, ileus, pyloric stenosis, urinary retention, gastric retention, hypersensitivity, closed-angle glaucoma

**Precautions:** Pregnancy, breastfeeding, children, renal/hepatic disease, urinary tract obstruction, ambient temperature increase, autonomic neuropathy, constipation, contact lenses, hazardous activity, GERD, gastroparesis, myasthenia gravis, prostatic hypertrophy, toxic megacolon, ulcerative colitis, possible cross-sensitivity with tolterodine

## DOSAGE AND ROUTES
**Adult and geriatric:** PO EXT REL 4 mg/day, may increase to 8 mg/day based on response, max 4 mg/day in those taking potent CYP3A4 inhibitors

### Renal dose
**Adult:** PO EXT REL CCr <30 ml/min max 4 mg

**Available forms:** Ext rel tabs 4, 8 mg

### Implementation
- Do not break, crush, or chew ext rel product
- Give without regard to meals
- Store at room temperature; protect from moisture

## ADVERSE EFFECTS
**CNS:** Insomnia, headache, dizziness
**CV:** Chest pain, angina, QT prolongation, peripheral edema
**EENT:** Xerophthalmia
**GI:** *Nausea, vomiting,* abdominal pain, constipation, dry mouth
**GU:** Dysuria, urinary retention, urinary tract infection
**INTEG:** Rash, angioedema
**MISC:** Peripheral edema, insomnia
**MS:** Back pain

**RESP:** Cough, upper respiratory infection
**SYST:** Infection

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid |
| **Distribution** | Protein binding 50% |
| **Metabolism** | Unknown |
| **Excretion** | Urine, feces |
| **Half-life** | 7 hr |

### Pharmacodynamics

| | |
|---|---|
| **Peak** | 5 hr |

## INTERACTIONS

### Drug classifications

Anticholinergics, antimuscarinics: increased anticholinergic effect
CYP3A4 inhibitors (antiretroviral protease inhibitors, azole antifungals), avoid use with doses >4 mg, not recommended, macrolide antiinfectives: increased action of fesoterodine

### Drug/herb

Caffeine, green tea, guarana: decreased fesoterodine

### Drug/lab test

Increase: ALT

## NURSING CONSIDERATIONS

### Assessment

- **Assess urinary patterns:** distention, nocturia, frequency, urgency, incontinence
- **Angioedema:** Assess for swelling of face, tongue, throat, may occur anytime during treatment, have emergency equipment nearby
- **Pregnancy/breastfeeding:** Avoid in pregnancy/breastfeeding unless benefits outweigh fetal risk, no controlled studies

### Patient/family education

- Advise patient not to drink liquids before bedtime
- Instruct the patient on the importance of bladder maintenance
- Teach patient to avoid increased temperature
- Teach patient not to drive or operate machinery until response is known
- Teach patient to avoid alcohol, drowsiness may occur
- Teach patient to report immediately allergic reactions, including, rash, swelling of mouth, face, lips, trouble breathing
- Teach patient not to use new meds, herbs without prescriber approval

### Evaluation

#### Positive therapeutic outcome

- Absence of urinary frequency, urgency, incontinence

# fexofenadine (Rx, OTC)

(fex-oh-fin'a-deen)
**Allegra, Mucinex Allergy**
*Func. class.:* Histamine antagonist, 2nd generation
*Chem. class.:* Piperidine, peripherally selective

**Do not confuse:** Allegra/Viagra

## ACTION:

Acts on blood vessels, GI, respiratory system by competing with histamine for $H_1$-receptor site

**Therapeutic outcome:** Absence of allergy symptoms and rhinitis

## USES:

Rhinitis, allergy symptoms, chronic idiopathic urticaria

## CONTRAINDICATIONS

Breastfeeding, newborn or premature infants, hypersensitivity

**Precautions:** Pregnancy, children, geriatric, respiratory disease, closed-angle glaucoma, prostatic hypertrophy, bladder neck obstruction, asthma, renal failure

## DOSAGE AND ROUTES

**Adult and child >12 yr:** PO Rx only 60 mg bid or 180 mg/day; PO OTC only 60 mg bid or 180 mg/day (self-treatment of allergic rhinitis)
**Child 6-11 yr:** PO 30 mg bid; Orally disintegrating tab 30 mg bid dissolved on tongue

### Renal dose

**Adult and child ≥12 yr:** PO CCr <80 ml/min 60 mg/day
**Child 2-11 yr:** PO CCr <80 ml/min 30 mg/day
**Child <2 yr:** PO CCr <80 ml/min 15 mg/day

**Available forms:** Caps 60 mg; tabs 30, 60, 180 mg; oral susp 6 mg/ml; orally disintegrating tab 30 mg

### Implementation

- Give without regard to meals; caps/tabs should not be given with or right before grapefruit, orange, or apple juice
- **Orally disintegrating tab:** allow to dissolve, swallow
- **Oral susp:** shake well, use calibrated measuring device
- Store in tight, light-resistant container

## ADVERSE EFFECTS

**CNS:** Headache, stimulation, drowsiness, sedation, fatigue, confusion, blurred vision, tinnitus, restlessness, tremors, paradoxical excitation in children or geriatric

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 1 hr |
| **Peak** | 2-3 hr |
| **Duration** | 12-24 hr |

## INTERACTIONS

### Individual drugs

Erythromycin, ketoconazole: increased fexofenadine effect
Rifampin: decreased fexofenadine effect
Aluminum, antacids, magnesium: decreased fexofenadine effect

### Drug/food

Apple, orange, grapefruit juice: decreased absorption

### Drug/lab test

False negative: skin allergy tests (discontinue antihistamine 3 days before testing)

## NURSING CONSIDERATIONS

### Assessment

- **Allergy:** assess for itchy, runny, watery eyes; congested nose; before and during treatment
- Assess respiratory status: rate, rhythm, increase in bronchial secretions, wheezing, chest tightness; provide fluids to 2 L/day to decrease secretion thickness
- **Pregnancy/breastfeeding:** Avoid use in first trimester, no well-controlled studies, use only if benefits outweigh fetal risk, use cautiously in breastfeeding

### Patient/family education

- Teach all aspects of product uses; to notify prescriber if confusion, sedation, hypotension occur; to avoid driving or other hazardous activity if drowsiness occurs; to avoid alcohol or other CNS depressants that may potentiate effect
- Instruct patient to take 1 hr before or 2 hr after meals to facilitate absorption
- Teach patient that hard candy, gum, frequent rinsing of mouth may be used for dryness
- Teach patient to take with water, avoid fruit juices as they may decrease effectiveness

### Evaluation

#### Positive therapeutic outcome

- Absence of running or congested nose, rashes

## TREATMENT OF OVERDOSE:

Administer lavage, diazePAM, vasopressors, **IV** phenytoin

# fidaxomicin (Rx)

(fye-dax-oh-mye'sin)
**Dificid**
*Func. class.:* Antiinfective-macrolide

**ACTION:** Bactericidal against *Clostridium difficile;* is a fermentation product obtained from *Dactylosporangium aurantiacum;* inhibits RNA synthesis by inhibiting transcription of bacterial RNA polymerases; may act at the early stages of transcription

**Therapeutic outcome:** Resolution of *C. difficile* based on stool culture

**USES:** Pseudomembranous colitis, *C. difficile*-associated diarrhea

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children

## DOSAGE AND ROUTES

**Adult: PO** 200 mg bid × 10 days

**Available forms:** Tab 200 mg

### Implementation:

- Give without regard to food
- Store at room temperature

## ADVERSE EFFECTS

**GI:** Nausea, vomiting, abdominal pain, GI bleeding, intestinal obstruction
**HEMA:** Anemia, neutropenia
**INTEG:** Rash, pruritus
**META:** Metabolic acidosis, hyperglycemia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Minimal |
| **Distribution** | GI tract |
| **Metabolism** | P-glucoprotein |
| **Excretion** | Feces 92%; parent drug |
| **Half-life** | 12 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | <1 hr |
| **Peak** | 1 hr |
| **Duration** | 1-5 hr |

## INTERACTIONS

### Individual drugs

CycloSPORINE: Increased fidaxomicin action

### Drug/lab test
Increased: glucose, LFTs, alk phos
Decreased: sodium bicarbonate, platelets

## NURSING CONSIDERATIONS
### Assessment
• **Pseudomembranous colitis:** Assess for diarrhea, abdominal pain, fever, fatigue, anorexia, possible anemia, elevated WBC and low serum albumin; this product may be used in place of vancomycin (PO); monitor CBC with differential, and stool culture (*C. difficile*); not to be used for systemic infection; obtain C&S prior to use; monitor glucose (diabetic patients); monitor fluid, electrolyte depletion
• Pregnancy/breastfeeding: No harm to fetus in animal studies, no well-controlled studies in pregnant women, use only if clearly needed, use cautiously in breastfeeding

### Patient/family education
• Advise patient to report GI bleeding, severe abdominal pain, continuing diarrhea
• Teach patient to report if pregnancy is planned or suspected or if breastfeeding
• Teach patient to take without regard to food, to take as directed, must take all of the medication

### Evaluation
**Positive therapeutic outcome**
• Resolution of *C. difficile,* decreased diarrhea

**⚠ HIGH ALERT**

## filgrastim (Rx)
(fill-gras'stim)
**Neupogen, Zarxio**
*Func. class.:* Biological modifier
*Chem. class.:* Granulocyte colony-stimulating factor

**Do not confuse:** Neupogen/Neumega

**ACTION:** Stimulates proliferation and differentiation of neutrophils; a glycoprotein

**Therapeutic outcome:** Absence of infection

**USES:** To decrease infection in patients receiving antineoplastics that are myelosuppressive; to increase WBC in patients with product-induced neutropenia; bone marrow depression, acute radiation exposure

**Unlabeled uses:** Neutropenia in HIV infection, aplastic anemia, ganciclovir-induced neutropenia, zidovudine-induced neutropenia

## CONTRAINDICATIONS
Hypersensitivity to proteins of *Escherichia coli*

**Precautions:** Pregnancy, breastfeeding, children, myeloid malignancies, radiation therapy, sepsis, sickle cell disease, chemotherapy, respiratory disease

## DOSAGE AND ROUTES
### After myelosuppressive chemotherapy
**Adult and child:** **IV**/SUBCUT 5 mcg/kg/day in a single dose up to 14 days; may increase by 5 mcg/kg in each chemotherapy cycle

### After myelosuppresive doses of radiation
**Adult and child >7 mo:** SUBCUT 10 mcg/kg/day, start as soon as possible after receiving ≥2 gray (Gy)

### After bone marrow transplantation
**Adult:** **IV**/SUBCUT 10 mcg/kg as an INF (**IV**) over 4 or 24 hr, begin 24 hr after chemotherapy and 24 hr after bone marrow transplantation

### Peripheral blood progenitor cell collection/therapy
**Adult:** 10 mcg/kg/day as a BOL or CONT INF × 4 days or more before leukapheresis, continue to last leukapheresis, may alter dose if WBC >100,000/mm$^3$

### Severe neutropenia (chronic), idiopathic/cyclical
**Adult:** SUBCUT 5 mcg/kg daily

### Neutropenia neonates
IV/SUBCUT: 5-10 mcg/kg/day × 3-5 days

**Available forms:** Inj 300 mcg/ml, 480 mcg/1.6 ml, 480 mcg/0.8 ml

### Implementation
• Store in refrigerator; do not freeze; may store at room temp up to 24 hr
• Given by subcut injection, short IV infusion, continuous SC or IV infusion
• Avoid use within 24 hr before or after chemotherapy
• Do not shake commercial single-dose vials prior to withdrawing the dose. If the vial is shaken and froth or bubbles form, allow the vial to stand undisturbed for a few min until the froth or bubbles dissipate
• Prior to injection, filgrastim may be allowed to reach room temperature for a maximum of 24 hr. Any vial or syringe exposed to room temperature for more than 24 hr should be discarded
• Visually inspect for particulate matter and discoloration prior to use

**IV route**
- May be diluted with 5% dextrose. Do not dilute with NS; product may precipitate
- May be diluted to concentrations 5-15 mcg/ml; should be protected from absorption to plastic by the addition of albumin to a final albumin concentration of 2 mg/ml. Do not dilute filgrastim to a concentration <5 mcg/ml

**IV infusion**
- Infuse IV over 15-30 min or as a continuous infusion over 24 hr

**SUBCUT route**
- May divide into 2 injections if dose is >1 ml
- Subcut injection: no dilution is necessary; inject by rapid subcut injection taking care not to inject intradermally, inject into abdomen, upper outer buttock, upper outer arm, rotate sites
- Subcut continuous infusion: infuse subcut at a rate not to exceed 2 ml/hour

**Y-site compatibilities:** Acyclovir, allopurinol, amikacin, aminophylline, ampicillin, ampicillin/sulbactam, aztreonam, bleomycin, bumetanide, buprenorphine, butorphanol, calcium gluconate, CARBOplatin, carmustine, cefAZolin, cefoTEtan, cefTAZidime, chlorproMAZINE, cimetidine, CISplatin, cyclophosphamide, cytarabine, dacarbazine, DAUNOrubicin, dexamethasone, diphenhydrAMINE, DOXOrubicin, doxycycline, droperidol, enalaprilat, famotidine, floxuridine, fluconazole, fludarabine, gallium, ganciclovir, granisetron, haloperidol, hydrocortisone, hydroMORPHONE, hydrOXYzine, IDArubicin, ifosfamide, leucovorin, LORazepam, mechlorethamine, melphalan, meperidine, mesna, methotrexate, metoclopramide, miconazole, minocycline, mitoXANTRONE, morphine, nalbuphine, netilmicin, ondansetron, plicamycin, potassium chloride, promethazine, ranitidine, sodium bicarbonate, streptozocin, ticarcillin, ticarcillin/clavulanate, tobramycin, trimethoprim-sulfamethoxazole, vancomycin, vinBLAStine, vinCRIStine, vinorelbine, zidovudine

## ADVERSE EFFECTS

**CNS:** Fever, headache
**GI:** Nausea, vomiting, diarrhea, mucositis, anorexia, splenic rupture
**HEMA:** Thrombocytopenia, excessive leukocytosis
**INTEG:** Alopecia, exacerbation of skin conditions, urticaria, cutaneous vasculitis, allergic reactions
**MS:** Osteoporosis, skeletal pain
**OTHER:** Chest pain, hypotension
**RESP:** Acute respiratory distress syndrome, wheezing, alveolar hemorrhage

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (SUBCUT), completely absorbed (**IV**) |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Unknown |

### Pharmacodynamics

| | IV | SUBCUT |
|---|---|---|
| **Onset** | 5-60 min | 5-60 min |
| **Peak** | 24 hr | 2-8 hr |
| **Duration** | up to 1 wk | up to 1 wk |

F

## INTERACTIONS

### Individual drugs

Lithium: do not use concurrently

### Drug classifications

Antineoplastics: increased neutrophils, do not use together 24 hr before or after antineoplastics

### Drug/lab test

Increased: uric acid, lactate dehydrogenase, alkaline phosphatase, WBC

## NURSING CONSIDERATIONS

### Assessment

- Monitor blood studies: CBC, platelet count before treatment and twice weekly; neutrophil counts (ANC) drop by 50% if filgrastim is discontinued the next day but treatment should continue until ANC >10,000/mm$^3$
- Assess for bone pain: frequency, intensity, duration; analgesics may be given; opiates should not be used
- Check B/P, heart rate, respiration; baseline, during treatment
- **Respiratory distress syndrome:** fever, dyspnea; withhold product if these occur
- **Allergic reactions:** rash, wheezing, facial edema, dyspnea may occur within 30 min of use; give antihistamines, bronchodilators and EPINEPHrine if needed
- **Splenic rupture:** severe left upper abdominal pain
- **Pregnancy/breastfeeding:** If used in pregnancy, enroll in the Amgen Surveillance Program 800-772-6436, use only if benefits outweigh risk to fetus, use caution in breastfeeding

### Patient/family education

- Teach patient technique for self-administration: dose, side effects, disposal of containers and needles; provide instruction sheet
- That bone pain is common

### Evaluation
**Positive therapeutic outcome**
- Absence of infection

## finasteride (Rx)
(fin-ass′te-ride)
**Propecia, Proscar**
*Func. class.:* Androgen hormone inhibitor, hair stimulant
*Chem. class.:* 5-α-Reductase inhibitor

**Do not confuse:** Proscar/ProSom/Prozac, finasteride/furosemide

**ACTION:** Inhibits 5-α-reductase and reduction in dihydrotestosterone (DHT); DHT induces androgenic effects by binding to androgen receptors in the cell nuclei of the prostate gland, liver, skin; prevents development of benign prostatic hypertrophy (BPH)

**Therapeutic outcome:** Reduced prostate size

**USES:** Symptomatic BPH; male-pattern baldness (Propecia)

## CONTRAINDICATIONS
Pregnancy, breastfeeding, children, women who are pregnant or may become pregnant should not handle tabs, hypersensitivity

**Precautions:** Large residual urinary volume, severely diminished urinary flow, liver function abnormalities

## DOSAGE AND ROUTES
### BPH
**Adult:** PO 5 mg/day × 6-12 mo

### Male-pattern baldness
**Adult:** PO 1 mg/day for 3 mo or more for results

**Available forms:** Tabs (Propecia) 1 mg, (Proscar) 5 mg

### Implementation
- Administer without regard to meals; give for a minimum of 6 mo; not all patients will respond
- Store at temp <86° F (30° C); protect from light; keep container tightly closed

## ADVERSE EFFECTS
**GU:** Impotence, decreased libido, decreased volume of ejaculate, sexual dysfunction, gynecomastia
**INTEG:** Rash
**MISC:** Breast tenderness, secondary malignancy

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 63%, readily |
| **Distribution** | Plasma protein binding, crosses blood-brain barrier |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, metabolites (39%); feces (57%) |
| **Half-life** | 6-15 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Immediate |
| **Peak** | 1-2 hr |
| **Duration** | 14 days |

## INTERACTIONS
### Drug classifications
Anticholinergics, bronchodilators (adrenergic), theophylline: decreased effect of finasteride

### Drug/lab test
Decreased: PSA levels (finasteride)

## NURSING CONSIDERATIONS
### Assessment
- **BPH:** Assess urinary patterns, residual urinary volume, severely diminished urinary flow; PSA levels and digital rectal exam results before initiating therapy and periodically thereafter
- Monitor liver function tests before initiating treatment; extensively metabolized in liver

### Patient/family education
- Advise patient that pregnant women or women who may become pregnant should not touch crushed tab or come into contact with semen of a patient taking this product; may adversely affect development of male fetus
- **Pregnancy/breastfeeding:** Contraindicated in pregnancy, breastfeeding, pregnant women or those trying to conceive should not handle crushed or broken tabs or come in contact with semen from male using product
- Inform patient that volume of ejaculate may be decreased during treatment; impotence and decreased libido may also occur and may continue after discontinuing treatment
- Inform patient that Propecia results may not occur for 3 mo
- Inform patient that Proscar results may not occur for 6-12 mo

### Evaluation
**Positive therapeutic outcome**
- Decreased postvoiding dribbling, frequency, nocturia

- Increased urinary flow
- Regression of prostate size
- Hair growth within 3-6 mo

## fingolimod (Rx)

(fin-gol′i-mod)
**Gilenya**
*Func. class.:* Immunosuppressant
*Chem. class.:* Sphingosine 1-phosphate receptor modulator

**ACTION:** Binds with high affinity to sphingosine 1 phosphate receptors, blocks lymphocyte egress to lymph nodes, reducing the number of peripheral blood lymphocytes, may reduce lymphocyte migration into the CNS

**Therapeutic outcome:** Improved symptoms of multiple sclerosis and prevention of increasing disability

**USES:** To reduce frequency of exacerbation, to delay physical disability of relapsing forms of MS

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** AIDS, asthma, AV block, bradycardia, breastfeeding, dysrhythmias, cardiac disease, children, COPD, diabetes mellitus, heart failure, hepatic disease, HIV, hypertension, immunosuppression, infants, leukemia, lymphoma, neonates, pregnancy, QT prolongation, respiratory insufficiency, sick sinus syndrome, syncope, uveitis

## DOSAGE AND ROUTES

**Adult:** PO 0.5 mg/day

### Hepatic dose

**Adult:** PO Child-Pugh C, total score >10: Closely monitor, fingolimod exposure is doubled

**Available forms:** Cap 0.5 mg

### Implementation

**PO route**

- Watch patient for 6 hr after initial dose or if product is not given for >2 wk for development of bradycardia. Give without regard to food
- Store at room temperature, protect from moisture

## ADVERSE EFFECTS

**CNS:** Asthenia, depression, fatigue, headache, dizziness, progressive multifocal leukoencephalopathy, migraine, paresthesias, stroke
**CV:** AV block, bradycardia, chest pain, hypertension, palpitations, QT prolongation
**EENT:** Blurred vision, vision impairment, ocular pain, macular edema
**GI:** Abdominal pain, anorexia, diarrhea, jaundice, vomiting, weight loss, hepatotoxicity
**HEMA:** Leukopenia, lymphopenia, neutropenia
**INTEG:** Alopecia, pruritus
**MS:** Back pain
**RESP:** Dyspnea, cough
**SYST:** Infection, influenza, secondary malignancy

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Protein binding (99.7%) |
| **Distribution** | Distributed to RBCs (86%) |
| **Metabolism** | Metabolized by CYP4F2 and CYP2D6 to a lesser extent |
| **Excretion** | Excreted in urine (81% inactive metabolites) |
| **Half-life** | Terminal half-life 6-9 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 12-16 hr |
| **Duration** | Steady state 1-2 mo |

## INTERACTIONS

### Individual drugs

Digoxin: increased risk of heart block, serious bradycardia, avoid if possible
Ketoconazole: increased fingolimod effect

### Drug classifications

Class Ia/III antidysrhythmics: increased risk of torsades de pointes
β-blockers, calcium channel blockers: increased risk of heart block, serious bradycardia
Antineoplastics, immunosuppressants, immune modulating therapies: increased immunosuppression
Inactive vaccines, toxoids: decreased effects
Live vaccines: increased infection risk

## NURSING CONSIDERATIONS

### Assessment

- **Multiple sclerosis:** Assess for improving paresthesia, muscle weakness, clonus, muscle spasms, difficulty in moving, difficulty in coordination in balance, speech, swallowing, vision problems, fatigue; prevention of increasing disability
- **Monitor laboratory values:** obtain before initial dose, CBC, LFTs, serum bilirubin, ophthalmologic exam, antibodies to VZ V if there is not a history of chickenpox or without vaccination, may give VZV vaccination of antibody-negative patient before giving

product, postpone for 1 month after vaccination; obtain ECG for evidence of bradycardia, or AV block
- **Progressive multifocal leukoencephalopathy (PML):** Assess for confusion, apathy, dizziness, unstable gait; may be fatal; discontinue product; contact prescriber
- **Bradycardia:** Monitor for ≥6 hr after beginning dose, ECG before and after 1st dose, if heart rate 45 bpm or new heart block (2nd degree) occurs, do not use until resolved
- Monitor for QT prolongation
- **Pregnancy/breastfeeding:** No well-controlled studies, may cause fetal harm, pregnant women should enroll in Gilenya Pregnancy Registry 877-598-7237, use contraception during and for 2 mo after final dose, do not breastfeed

### Patient/family education
- Provide med guide to patient and explain use of product and expected results
- Advise patient that continuing follow-up exams and laboratory tests will be required on a regular basis
- Advise patient to use contraception during and for 2 months after conclusion of treatment
- **Liver dysfunction:** Teach patient to report jaundice, nausea, vomiting, anorexia, abdominal pain, fatigue, dark urine
- **Cardiac changes:** Chest pain, palpitations

### Evaluation
**Positive therapeutic outcome**
- Improved symptoms of multiple sclerosis and prevention of increasing disability

## fluconazole (Rx)
(floo-kon'a-zole)
**Diflucan Canesoral, Diflucan, Monicure**
*Func. class.:* Antifungal
*Chem. class.:* Triazole

**Do not confuse:** Diflucan/Diprivan

**ACTION:** Inhibits ergosterol biosynthesis, causes direct damage to membrane phospholipids in the cell wall of fungi

**Therapeutic outcome:** Fungistatic fungicidal against the following susceptible organisms: *Candida, Cryptococcus neoformans*

**USES:** Oropharyngeal candidiasis; chronic mucocutaneous candidiasis; systemic, vaginal, urinary candidiasis; cryptococcal meningitis; prevention of candidiasis in bone marrow transplant in those who receive chemotherapy and/or radiation therapy, cystitis, fungal prophylaxis, peritonitis, pneumonia, pyelonephritis

## CONTRAINDICATIONS
Hypersensitivity to this product or azoles, pregnancy

**Precautions:** Breastfeeding, renal/hepatic disease, torsades de pointes

## DOSAGE AND ROUTES
### Vulvovaginal candidiasis
**Adult:** PO 150 mg as a single dose; prevention of recurrence (unlabeled) 150 mg/day × 3 days, then qwk × 6 mo

### Serious fungal infections
**Adult:** PO/**IV** 50-400 mg initially, then 200 mg once daily for 4 wk
**Child:** PO/**IV** 6-12 mg/kg/day

### Oropharyngeal candidiasis
**Adult:** PO/**IV** 200 mg initially, then 100 mg/day for at least 2 wk
**Child >14 days:** PO/**IV** 6 mg/kg initially, then 3 mg/kg/day for ≥2 wk
**Neonates <14 days, 30-60 wk gestation:** PO/**IV** 6 mg/kg q48hr

### Esophageal candidiasis
**Adult:** PO/**IV** 200 mg on 1st day, then 100 mg/day × ≥3 wk and for ≥2 wk after resolution of symptoms
**Child:** PO/**IV** 6 mg/kg on 1st day, then 3 mg/kg/day × ≥3 wk and for ≥2 wk after resolution of symptoms

### Cryptococcal meningitis
**Adult:** PO/**IV** 400 mg on 1st day, then 200 mg/day × 10-12 wk after CSF culture negative, suppressive therapy 200 mg qday
**Child/infant/neonate >14 days:** PO/**IV** 12 mg/kg on 1st day, then 6-12 mg/kg/day × 10-12 wk after negative CSF culture, suppressive therapy 6 mg/kg/day
**Neonate 0-14 days:** PO/**IV** 12 mg/kg on 1st day, then 6-12 mg/kg q72hr × 10-12 wk after negative CSF culture

### Prevention of candidiasis in bone marrow transplant
**Adult:** PO/**IV** 400 mg/day; those anticipated to have neutrophils <500/mm$^3$, start several days prior to anticipated onset of neutropenia and continue for 7 days after rise of neutrophils >1000/mm$^3$

**Child >14 days:** PO/**IV** 10-12 mg/kg/day, max 600 mg/day

## Renal dose

**Adult:** PO CCr <50 ml/min after loading dose, give 50% of usual dose; hemodialysis give 100% of usual dose after dialysis treatment, give dose as per CCr on nondialysis days

**Available forms:** Tabs 10, 40, 50, 100, 150, 200 mg; inj 2 mg/ml; powder for oral susp 50, 200 mg/ml

## Implementation

- Take with food to reduce GI effects

**PO route**

- Add water in 2 portions, review manufacturer reconstitution instructions
- Shake oral susp before each use; use within 2 wk

**Intermittent IV infusion route**

- Give after diluting according to package directions; run at 200 mg/hr or less; do not use plastic containers in connections
- Do not admix
- Administer **IV** using an in-line filter, using distal veins; check for extravasation and necrosis q2hr
- Give product only after C&S confirms organism, product needed to treat condition
- Store protected from moisture and light, diluted sol is stable for 24 hr

**Y-site compatibilities:** Acyclovir, aldesleukin, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amiodarone, anidulafungin, ascorbic acid injection, atenolol, atracurium, atropine, azaTHIOprine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride, CARBOplatin, caspofungin, ceFAZolin, cefepime, cefmetazole, cefonicid, cefoTEtan, cefOXitin, cefpirome, cefTAZidime, ceftizoxime, ceftobiprole, cephalothin, cephapirin, chlorproMAZINE, cimetidine, cisatracurium, CISplatin, codeine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dilTIAZem, dimenhyDRINATE, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doripenem, doxacurium, DOXOrubicin, DOXOrubicin liposomal, doxycycline, droperidol, drotrecogin alfa, enalaprilat, ePHEDrine, EPINEPHrine, epiRUBicin, epoetin alfa, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, filgrastim, fludarabine, fluorouracil, folic acid, foscarnet, gallium, ganciclovir, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, IDArubicin, ifosfamide, IV immune globulin, inamrinone, indomethacin, insulin (regular), irinotecan, isoproterenol, ketorolac, labetalol, lansoprazole, leucovorin, levofloxacin, lidocaine, linezolid, LORazepam, LR, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, meropenem, metaraminol, methicillin, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, mezlocillin, miconazole, midazolam, milrinone, minocycline, mitoXANTRONE, morphine, moxalactam, multiple vitamins injection, mycophenolate, nafcillin, nalbuphine, naloxone, nesiritide, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, papaverine, PEMEtrexed, penicillin G potassium/sodium, pentazocine, PENTobarbital, PHENobarbital, phenylephrine, phenytoin, phytonadione, piperacillin-tazobactam, polymyxin B, potassium chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, pyridoxine, quiNIDine, quinupristin-dalfopristin, ranitidine, remifentanil, Ringer's, ritodrine, riTUXimab, rocuronium, sargramostim, sodium acetate/bicarbonate, succinylcholine, SUFentanil, tacrolimus, temocillin, teniposide, theophylline, thiotepa, ticarcillin-clavulanate, tigecycline, tirofiban, TNA, tobramycin, tolazoline, TPN, trastuzumab, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

**Y-site incompatibilities:** Amphotericin B, ampicillin, dantrolene, diazePAM, gemtuzumab, pantoprazole, trimethoprim/sulfamethoxazole

## ADVERSE EFFECTS

**CNS:** *Headache,* seizures
**CV:** QT prolongation, torsades de pointes
**GI:** *Nausea, vomiting,* diarrhea, cramping, flatus, increased AST, ALT, hepatotoxicity, abdominal pain, cholestasis
**HEMA:** Agranulocytosis, eosinophilia, leukopenia, neutropenia, thrombocytopenia
**INTEG:** Stevens-Johnson syndrome, angioedema, anaphylaxis, exfoliative dermatitis, toxic epidermal necrolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO) |
| **Distribution** | Widely distributed (peritoneum, CSF) |
| **Metabolism** | <10%, liver |
| **Excretion** | 80% kidneys (unchanged) |
| **Half-life** | 30 hr, increased in renal disease |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | Unknown | Immediate |
| **Peak** | 1-2 hr | Infusion's end |
| **Duration** | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Alfentanil, buprenorphine, ergot, fentaNYL, methadone, saquinavir, SUFentanil, zidovudine: increased effect of each specific drug

CycloSPORINE, phenytoin, rifabutin, sirolimus, tacrolimus, theophylline, zidovudine, zolpidem: increased plasma concentrations

Lovastatin, simvastatin: increased myopathy, rhabdomyolysis risk

Warfarin: increased anticoagulation

### Drug classification

Calcium channel blockers: decreased effect

Oral sulfonylureas (glipiZIDE): hypoglycemia

Proton pump inhibitors: decreased fluconazole

### Drug/herb

Gossypol: increased nephrotoxicity

### Drug/lab test

Increased: alk phos, LFTs

Decreased: WBC, platelets

## NURSING CONSIDERATIONS

### Assessment

- **Assess for signs and symptoms of infection:** clearing of CSF culture during treatment, obtain C&S baseline and during treatment, product may be started as soon as culture is taken
- **QT prolongation:** Avoid with other products that cause QT prolongation
- **Monitor for hepatotoxicity:** increased AST, ALT, alkaline phosphatase, bilirubin; discontinue product if hepatotoxicity occurs
- **Pregnancy/breastfeeding:** Do not use in pregnancy for most indications, birth defects may occur, use cautiously in breastfeeding
- **Monitor for skin symptoms:** color, lesions, injection site reactions; if lesions progress, discontinue product; monitor rash, usually after second week of treatment and disappears in 2 wk if continuing product

### Patient/family education

- Caution patient that long-term therapy may be needed to clear infection; to take entire course of medication; take in equal intervals (PO), not to add new meds, herbs without prescriber approval
- **Teach patient the signs and symptoms of hepatotoxicity:** nausea, vomiting, clay-colored stools, dark urine, anorexia, fatigue, jaundice, skin rash; prescriber should be notified immediately, abdominal pain, fever, bruising, bleeding
- Inform patient that medication may be taken with food to reduce GI effects

### Evaluation

**Positive therapeutic outcome**

- Decreasing oral candidiasis, fever, malaise, rash
- Negative C&S for infecting organism

**RARELY USED**

## fludrocortisone (Rx)

(floo-droe-kor'ti-sone)

**Florinef**

*Func. class.:* Synthetic corticosteroid

**Do not confuse:** Florinef/Floranex/Florastor

**ACTION:** Promotes increased reabsorption of sodium and loss of potassium, water, hydrogen from distal tubules

**Therapeutic outcome:** Correction of adrenal insufficiency

**USES:** Adrenal insufficiency, salt-losing adrenogenital syndrome, Addison's disease

## CONTRAINDICATIONS

Children <2 yr, hypersensitivity

**Precautions:** HF, hypertension, diabetes, acute glomerulonephritis, amebiasis, psychosis, Cushing's syndrome, fungal infections, pregnancy, breastfeeding, children >2 yrs, osteoporosis

## DOSAGE AND ROUTES

**Adult:** PO 100-200 mcg/day

**Child:** PO 50-100 mcg/day

**Available forms:** Tabs 100 mcg (0.1 mg)

### Implementation

- Titrate to lowest dose
- Give with food or milk to decrease GI symptoms
- Tabs are scored and may be divided

## ADVERSE EFFECTS

**CV:** Hypertension, circulatory collapse, thrombophlebitis, embolism, tachycardia, HF, edema

**CNS:** Flushing, sweating, headache, paralysis, dizziness, seizure

**ENDO:** Weight gain, adrenal suppression, hyperglycemia

**META:** Hypokalemia

**MISC:** Hypersensitivity, cataracts, GI ulcers, anaphylaxis, infection
**MS:** Fractures, osteoporosis, weakness

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Urine |
| **Half-life** | 18-36 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1.5 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Barbiturates: decreased fludrocortisone action
Loop/thiazide diuretics, potassium-wasting products: increased potassium levels
Sodium-containing products: increased B/P

### Drug/lab test

Increased: potassium, sodium
Decreased: HCT

## NURSING CONSIDERATIONS

### Assessment

- Assess weight daily, notify prescriber of weekly gain >5 lb
- Monitor I&O, be alert for decreasing output, increasing edema
- Monitor B/P, pulse, notify prescriber of chest pain
- Potassium depletion: assess for paresthesia, fatigue, nausea, vomiting, dysrhythmias, weakness, depression, polyuria
- Electrolytes: monitor sodium, potassium, chloride; hypokalemia is common
- **Beers:** Avoid in older adults with or at high risk of delirium

### Patient/family education

- Teach patient that emergency ID as corticosteroid user should be carried
- Teach patient not to discontinue abruptly
- Instruct patient to notify health care provider of muscle cramps, weight gain, edema, nausea, infection, trauma, stress
- Advise patient to avoid exposure to disease, trauma

### Evaluation

**Positive therapeutic outcome**

- Correction of adrenal insufficiency

## flumazenil (Rx)

(flu-maz'e-nil)
**Anexate, Romazicon**
*Func. class.:* Antidote: Benzodiazepine receptor antagonist
*Chem. class.:* Imidazobenzodiazepine derivative

**Do not confuse:** flumazenil/influenza virus vaccine

F

**ACTION:** Antagonizes the actions of benzodiazepines on the CNS, competitively inhibits the activity at the benzodiazepine receptor complex

**Therapeutic outcome:** Reversed benzodiazepine toxic effects

**USES:** Reversal of the sedative effects of benzodiazepines

## CONTRAINDICATIONS

Hypersensitivity to this product or benzodiazepines, serious tricyclic overdose, patients given benzodiazepine for control of life-threatening condition

**Precautions:** Pregnancy, breastfeeding, children, geriatric, ambulatory patients, renal/hepatic disease, status epilepticus, head injury, labor and delivery, hypoventilation, panic disorder, drug/alcohol dependency, Benzodiazepine dependence

**BLACK BOX WARNING:** Benzodiazepine dependence, seizures

## DOSAGE AND ROUTES

### Reversal of conscious sedation or in general anesthesia

**Adult: IV** 0.2 mg (2 ml) given over 15 sec; wait 45 sec, then give 0.2 mg (2 ml) if consciousness does not occur; may be repeated at 60-sec intervals as needed (max 3 mg/hr) or 1 mg/5 min
**Child: IV** 10 mcg (0.01 mg)/kg; cumulative dose of 1 mg or less

### Management of suspected benzodiazepine overdose

**Adult: IV** 0.2 mg (2 ml) given over 30 sec; wait 30 sec, then give 0.3 mg (3 ml) over 30 sec if consciousness does not occur; further doses of 0.5 mg (5 ml) can be given over 30 sec at intervals of 1 min up to cumulative dose of 3 mg
**Child: IV** 10 mcg (0.01 mg/kg); cumulative dose of less than 1 mg

**Available forms:** Inj 0.1 mg/ml

### Implementation

**Direct IV route**
- Give directly undiluted or diluted in 0.9% NaCl, $D_5W$, or LR; give over 15-30 sec into running **IV**, check for extravasation
- Use large vein
- Check airway and **IV** access before administration
- Stable for 24 hr if drawn into a syringe or mixed with other solutions

## ADVERSE EFFECTS

**CNS:** Dizziness, agitation, emotional lability, confusion, seizures, somnolence, panic attacks
**CV:** Hypertension, palpitations, cutaneous vasodilatation, dysrhythmias, bradycardia, tachycardia, chest pain
**EENT:** Abnormal vision, blurred vision, tinnitus
**GI:** Nausea, vomiting, hiccups
**SYST:** Headache, inj site pain, increased sweating, fatigue, rigors

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Unknown |
| **Half-life** | 41-79 min |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 1-2 min |
| **Peak** | 10 min |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Zaleplon, zolpidem: antagonize action

### Drug classifications

Benzodiazepines: antagonize action
Toxicity: mixed product overdosage

## NURSING CONSIDERATIONS

### Assessment

- Assess cardiac status using continuous monitoring
- Assess for seizures, protect patient from injury; most likely in those who usually experience withdrawal from sedatives
- Assess for GI symptoms: nausea, vomiting; place in side-lying position to prevent aspiration
- **Assess for allergic reactions:** flushing, rash, urticaria, pruritus
- **Pregnancy/breastfeeding:** Use only if benefits outweigh risks to the fetus, use cautiously in breastfeeding, it is not known if product is excreted in breast milk

**BLACK BOX WARNING: Seizures/benzodiazepine dependence:** Do not use in those who have used these products for interictal psychosis, status epilepticus, use in ICU cautiously where there may be unrecognized benzodiazepine dependence

- Teach patient not to use with alcohol or other medications for at least 24 hr
- Teach patient sedation may occur after treatment

### Evaluation

**Positive therapeutic outcome**
- Decreased sedation, respiratory depression
- Absence of toxicity

## flunisolide nasal agent

*See Appendix B*

## fluocinolone topical

*See Appendix B*

## fluorometholone ophthalmic

*See Appendix B*

**⚠ HIGH ALERT**

## fluorouracil (Rx)

(flure-oh-yoor'a-sil)
**Adrucil, Carac, Efudex, Fluoroplex, Tolak**
*Func. class.:* Antineoplastic, antimetabolite
*Chem. class.:* Pyrimidine antagonist

**Do not confuse:** Cara/Kuric

**ACTION:** Inhibits DNA, RNA synthesis; interferes with cell replication by competitively inhibiting thymidylate synthesis; cell cycle specific (S phase)

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES: Systemic:** cancer of breast, colon, rectum, stomach, pancreas; **Topical:** superficial basal cell carcinoma; multiple actinic keratoses

**Unlabeled uses:** Anal, biliary tract, cervical, head and neck, hepatocellular, and ovarian cancers

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity, poor nutritional status, serious infections, dihydropyrimidine dehydrogenase deficiency (DPD), bone marrow suppression

**Precautions:** Children, renal/hepatic disease, angina, stomatitis, diarrhea, sunlight exposure, vaccination, occlusive dressing, GI bleeding

**BLACK BOX WARNING:** Requires a specialized care setting and experienced clinician

## DOSAGE AND ROUTES

Doses vary widely, doses are based on actual body weight, unless obese, then based on lean body weight

### Colon, rectal, breast, stomach, pancreatic cancer

**Adult: IV** 12 mg/kg/day × 4 days (max 800 mg), then 6 mg/kg on days 6, 8, 10, 12 if no toxicity, then 10-15 mg/kg as a single dose weekly maintenance dose (max 1 g/wk); *poor-risk patients:* 6 mg/kg/day × 3 days, then 3 mg/kg on days 5, 7, 9 if no toxicity (max 400 mg/day)

### Actinic/solar keratoses

**Adult:** TOP, (Carac) 1% cream/solution bid or 2%-5% SOL for hands

### Superficial basal cell carcinoma

**Adult:** TOP, (Efudex) 5% cream/solution 2 ×/day × 3-12 wk

**Available forms:** Inj 50 mg/ml; cream 0.5%, 1%, 4%, 5%; topical solution, 2%, 5%

### Implementation

- Avoid contact with skin (very irritating); wash completely to remove
- Give fluids **IV** or PO before chemotherapy to hydrate patient
- Give antiemetic 30-60 min before giving product to prevent vomiting, and prn for several days thereafter; antibiotics for prophylaxis of infection
- Provide liquid diet: carbonated beverages; gelatin may be added if patient is not nauseated or vomiting
- Rinse mouth tid-qid with water, club soda; brush teeth bid-qid with soft brush or cotton-tipped applicators for stomatitis; use unwaxed dental floss

**Topical route**

- The 1% strength is used on face, other higher strengths are used on other parts of the body
- Wear gloves when applying; may use with a loose dressing; use a plastic or wooden applicator, do not use occlusive dressings; may use gauze dressing

**IV route**

- Prepare in biological cabinet using gloves, gown, mask
- Double-check all amounts and type of product to be used, fatalities have occurred
- **IV Direct:** undiluted; may inject through Y-tube or 3-way stopcock; give over 1-3 min
- May be diluted in 0.9% NaCl, $D_5W$; given as an **Intermittent infusion:** infusion in plastic containers over 2-8 hr; do not refrigerate/freeze; protect from light; discard unused portion, stable for 24 hr at room temperature; do not use discolored, cloudy solution; solution is pale yellow; for crystals, dissolve by warming slowly and shaking; cool to body temperature before use

**Y-site compatibilities:** Acyclovir, alatrofloxacin, alfentanil, allopurinol, amifostine, amikacin, amphotericin B lipid complex, amphotericin B liposome, ampicillin, ampicillin-sulbactam, anidulafungin, argatroban, atenolol, atracurium, azithromycin, aztreonam, bivalirudin, bleomycin, bumetanide, butorphanol, calcium gluconate, CARBOplatin, ceFAZolin, cefepime, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, cimetidine, cisatracurium, CISplatin, clindamycin, codeine, cyclophosphamide, cycloSPORINE, DAPTOmycin, dexamethasone, digoxin, DOCEtaxel, DOPamine, doripenem, DOXOrubicin liposomal, enalaprilat, ePHEDrine, ertapenem, erythromycin, esmolol, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, foscarnet, fosphenytoin, furosemide, ganciclovir, gatifloxacin, gemcitabine, gentamicin, granisetron, heparin, hydrocortisone, HYDROmorphone, ifosfamide, imipenem-cilastatin, inamrinone, isoproterenol, ketorolac, labetalol, leucovorin, levorphanol, lidocaine, linezolid, magnesium sulfate, mannitol, melphalan, meperidine, meropenem, mesna, methohexital, methotrexate, methylPREDNISolone, metoprolol, metroNIDAZOLE, milrinone, mitoMYcin, mitoXANTRONE, morphine sulfate, nalbuphine, naloxone, nesiritide, nitroglycerin, nitroprusside, octreotide, ofloxacin, PACLitaxel, palonosetron, pamidronate, pancuronium, pantoprazole, PEMEtrexed, PENTobarbital, PHENobarbital, phenylephrine, piperacillin, piperacillin-tazobactam, potassium chloride/phosphates, procainamide, propofol, propranolol, ranitidine, remifentanil, riTUXimab, sargramostim, sodium acetate/bicarbonate/phosphates, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, teniposide, theophylline, thiopental, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, trastuzumab, vasopressin, vecuronium, vinBLAStine, vinCRIStine, vitamin B complex/C, voriconazole, zidovudine, zoledronic acid

**Y-site incompatibilities:** Droperidol, vinorelbine

## ADVERSE EFFECTS

### SYSTEMIC use

**CNS:** Lethargy, malaise, weakness, acute cerebellar dysfunction
**EENT:** Epistaxis, light intolerance, lacrimation
**GI:** *Anorexia, stomatitis,* diarrhea, nausea, vomiting, hemorrhage, enteritis, glossitis
**HEMA:** Thrombocytopenia, leukopenia, myelosuppression, anemia, agranulocytosis
**INTEG:** *Rash,* fever, photosensitivity, anaphylaxis, alopecia, hand-foot syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Completely bioavailable (**IV**), minimal (topical) |
| **Distribution** | Widely distributed, concentration in tumor |
| **Metabolism** | Liver, converted to active metabolite |
| **Excretion** | Lungs (60%-80%), kidneys (up to 15%) |
| **Half-life** | 16 min (IV) |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Leucovorin: increased toxicity, bone marrow depression
MetroNIDAZOLE: increased toxicity, irinotecan
Phenytoin: decreased effect of phenytoin
Radiation: increased toxicity, bone marrow suppression

### Drug classifications

Anticoagulants, NSAIDs, platelet inhibitors, thrombolytics: increased bleeding
Antineoplastics: increased toxicity, bone marrow depression
Live virus vaccines: decreased antibody response

### Drug/lab test

Increased: AST, ALT, LDH, serum bilirubin, Hct, Hgb, WBC, platelets, 5-HIAA
Decreased: albumin

## NURSING CONSIDERATIONS

### Assessment

- Monitor ECG; watch for ST-T wave changes, low QRS and T, possible dysrhythmias (sinus tachycardia, heart block, PVCs)
- Assess buccal cavity q8hr for dryness, sores or ulceration, white patches, oral pain, bleeding, dysphagia; obtain prescription for viscous lidocaine (Xylocaine)
- Assess tachypnea, ECG changes, dyspnea, edema, fatigue; identify dyspnea, crackles, unproductive cough, chest pain, tachypnea
- **Bone marrow suppression:** Monitor daily during IV treatment: monitor CBC, differential, platelet count daily (**IV**); withhold product if WBC is $<4000/mm^3$ or platelet count is $<100,000/mm^3$; notify prescriber of results if WBC $<20,000/mm^3$, platelets $<50,000/mm^3$; nadir of leukopenia within 2 wk, recovery 1 mo; if pretreatment of WBC $<2000/mm^3$ or platelets $<100,000/mm^3$, delay until recovery of counts above this level; nadir usually 9-14 days, recovery 30 days

**BLACK BOX WARNING:** Use only in a specialized care setting and with experienced clinician

- **Palmar-plantar erythrodysesthesia:** hand/foot tingling changing to pain, redness
- **Infiltration:** monitor frequently for pain, redness, inflammation at site; if present, stop infusion and start at new site; may use ice at site
- Monitor renal function studies: BUN, creatinine, serum uric acid, urine CCr before, during therapy; I&O ratio; report fall in urine output to $<30$ ml/hr
- Monitor temp q4hr (may indicate beginning of infection)
- Monitor liver function tests before, during therapy (bilirubin, AST, ALT, LDH) as needed or monthly; jaundice of skin, sclera, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea
- **Assess for bleeding:** hematuria, stool guaiac, bruising or petechiae, mucosa or orifices q8hr; avoid IM injections, rectal temperatures, inflammation of mucosa, breaks in skin
- **Pregnancy/breastfeeding:** Assess for pregnancy before starting therapy, do not use in pregnancy, breastfeeding
- **Assess for infection:** (fever, chills, cough, sore throat) those with current infections should be treated prior to receiving 5-FU, the dose reduced or discontinued if infection occurs
- **Toxicity:** Assess for hemorrhage, severe vomiting, severe diarrhea, stomatitis, WBC $<3500/mm^3$, platelets $<100,000$ notify prescriber
- **Acute cerebellar dysfunction:** Monitor for dizziness, weakness

### Patient/family education

- Caution patient that contraceptive measures are recommended during therapy

• **Bleeding:** Teach patient to avoid using aspirin, NSAIDs, or ibuprofen-containing products, razors, commercial mouthwash because bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools), IM injections if counts are low
• **Instruct patient to report signs of anemia** (fatigue, headache, irritability, faintness, SOB)
• **Instruct patient to report signs of stomatitis** (bleeding, white spots, ulcerations in the mouth); tell patient to examine mouth daily, to report symptoms; viscous lidocaine (Xylocaine) may be used
• Teach patient to avoid crowds, persons with known infections
• Advise patient to avoid vaccinations during therapy, to use sunscreen or stay out of the sun to prevent burns; about hair loss; explore use of wigs or other products until hair regrowth occurs

### Evaluation

**Positive therapeutic outcome**
• Prevention of rapid division of malignant cells

## FLUoxetine (Rx)

(floo-ox′uh-teen)
**PROzac, PROzac Weekly, Sarafem**
*Func. class.:* Antidepressant, selective serotonin reuptake inhibitor

**Do not confuse:** FLUoxetine/Loxitane, PROzac/Prograf/Provera/PriLOSEC, Sarafem/Serophene, FLUoxetine/DULoxetine/Loxitane, PARoxetine

**ACTION:** Inhibits CNS neuron uptake of serotonin but not of norepinephrine

**Therapeutic outcome:** Decreased symptoms of depression after 2-3 wk

**USES:** Major depressive disorder, obsessive-compulsive disorder (OCD), bulimia nervosa; *Sarafem:* premenstrual dysphoric disorder (PMDD), panic disorder

**Unlabeled uses:** Alcoholism, anorexia nervosa, borderline personality disorder, obesity, posttraumatic stress disorder, social phobia

## CONTRAINDICATIONS

Hypersensitivity, MAOI therapy

**Precautions:** Pregnancy, breastfeeding, geriatric, diabetes mellitus, narrow-angle glaucoma, cardiac malformations in infants (exposed to FLUoxetine in utero), osteoporosis, QT prolongation

**BLACK BOX WARNING:** Children, suicidal ideation

## DOSAGE AND ROUTES

### Depression/OCD

**Adult:** PO 20 mg/day AM; after 4 wk if no clinical improvement is noted, dosage may be increased to 20 mg bid in AM, afternoon; max 80 mg/day; PO 90 mg weekly
**Geriatric:** PO 10 mg/day, increase as needed
**Child 7-17 yr:** PO 5-10 mg/day, max 20 mg/day

### Alcoholism (unlabeled)

**Adult:** PO 20-80 mg/day

### Anorexia nervosa (unlabeled)

**Adult:** PO 10 mg every other day-20 mg/day

### Borderline personality disorder (unlabeled)

**Adult:** PO 20 mg/day, max 80 mg/day

### Kleptomania (unlabeled)

**Adult:** PO 60-80 mg/day

### Posttraumatic stress disorder (unlabeled)

**Adult:** PO 10-80 mg/day

### Premenstrual dysphoric disorder (Sarafem)

**Adult:** PO 20 mg/day, may be taken daily 14 days before menses

**Available forms:** Caps 10, 20, 40 mg; tabs 10, 20, 60 mg; oral sol 20 mg/5 ml; del rel caps (PROzac Weekly) 90 mg

### Implementation

• Give without regard to meals
• Give dose at bedtime if oversedation occurs during day; may take entire dose at bedtime; geriatric may not tolerate once/day dosing, crush if patient unable to swallow whole (tabs only), immediate-release product should be given in AM unless sedation occurs
• **PROzac Weekly:** Give on same day each week, swallow whole, do not crush, cut, chew
• Store at room temperature; do not freeze
• Sarafem is only used for premenstrual dysphoric disorder

## ADVERSE EFFECTS

**CNS:** *Headache, nervousness, insomnia, drowsiness, anxiety, tremor, dizziness, fatigue, sedation, poor concentration, abnormal dreams, agitation,* seizures, apathy, euphoria, hallucinations, delusions, psychosis, suicidal ideation, neuroleptic malignant syndrome–like reactions, serotonin syndrome

**CV:** *Hot flashes, palpitations,* angina pectoris, hemorrhage, hypertension, tachycardia, 1st-degree AV block, bradycardia, MI, thrombophlebitis, generalized edema, torsades de pointes
**EENT:** Visual changes, ear/eye pain, photophobia, tinnitus, increased intraocular pressure
**GI:** *Nausea, diarrhea, dry mouth, anorexia, dyspepsia, constipation,* taste changes, flatulence, decreased appetite
**GU:** *Dysmenorrhea, decreased libido, urinary frequency, urinary tract infection,* amenorrhea, cystitis, impotence, urine retention
**INTEG:** *Sweating, rash, pruritus,* acne, alopecia, urticaria; angioedema, exfoliative dermatitis, Stevens-Johnson syndrome, toxic epidermal necrolysis
**MS:** *Pain,* arthritis, twitching
**RESP:** *Pharyngitis, cough, dyspnea, bronchitis,* asthma, hyperventilation, pneumonia
**SYST:** *Asthenia,* serotonin syndrome, flulike symptoms, neonatal abstinence syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Crosses blood-brain barrier |
| **Metabolism** | Liver, extensively to norfluoxetine by CYP2D6 isoenzyme, some patients may be poor metabolizers |
| **Excretion** | Kidneys, unchanged (12%), metabolite (7%); steady state 28-35 days, protein binding 94% |
| **Half-life** | 1-3 days metabolite up to 1 wk |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 6-8 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
Antidiabetics: increased levels or toxicity
Bosentan, budesonide, carBAMazepine, darifenacin, diazePAM, digoxin, donepezil, lithium, paricalcitol, phenytoin, thioridazine, vinBLAStine, warfarin: increased toxicity
Cyproheptadine: decreased FLUoxetine effect
BusPIRone, haloperidol, loxapine, selegiline, thiothixene, tryptophan: increased serotonin syndrome, do not use concurrently

### Drug classifications

Increase: QT prolongation: pimozide, thioridazine, antidysrythmics class III
Anticoagulants, NSAIDs, platelet inhibitors, salicylates, thrombolytics: increased bleeding risk
Antidepressants, opioids, sedative/hypnotics: increased CNS depression
MAOIs, linezolid, methylene blue: hypertensive crisis, seizures; do not use with or 14 days prior to FLUoxetine
SSRIs, SNRIs, serotonin-receptor agonists, tricyclics: increased serotonin syndrome, do not use concurrently

### Drug/herb

Hops, kava, lavender, valerian: increased CNS effect
St. John's wort, SAM-e: do not use together; increased risk of serotonin syndrome

## NURSING CONSIDERATIONS

### Assessment

- Monitor B/P (lying, standing), pulse; if systolic B/P drops 20 mm hg, hold product and notify prescriber; take VS q4hr in patients with CV disease
- Monitor **blood studies:** CBC, leukocytes, differential, cardiac enzymes if patient is receiving long-term therapy; check platelets, bleeding can occur; thyroid growth rate (children)
- Monitor **hepatic studies:** AST, ALT, bilirubin
- Check weight qwk; appetite may increase with product
- Assess ECG for flattening of T-wave, bundle branch block, AV block, dysrhythmias in cardiac patients
- **Pregnancy/breastfeeding:** Use in pregnancy only if benefits outweigh risks to the fetus, avoid use in breastfeeding, excreted in breast milk

**BLACK BOX WARNING:** Assess mental status: mood, sensorium, affect, suicidal tendencies; increase in psychiatric symptoms: depression, panic; monitor for seizures; seizure potential is increased; Sarafem is not approved for children

- **Beers:** Avoid use in older adults unless safer alternative is not available, may cause ataxia, impaired psychomotor function
- Monitor urinary retention, constipation; constipation is more likely to occur in children or geriatric
- Identify patient's alcohol consumption; if alcohol is consumed, hold dose until AM
- **QT prolongation:** May be more severe in those with history of QT prolongation, if thioridazine is being used discontinue for 5 wk before using this product
- **Neuroleptic malignant syndrome:** Fever, seizures, diaphoresis, dyspnea, hyper/hypotension, report immediately

- **Serotonin syndrome:** symptoms can occur anytime after first dose, nausea/vomiting, sedation, dizziness, diaphoresis, mental changes, elevated B/P; if these occur product should be stopped, notify prescriber
- **Assess appetite in bulimia nervosa,** monitor weight daily, increase nutritious foods in diet, watch for bingeing and vomiting
- **Serious skin reactions:** angioedema, exfoliative dermatitis, Stevens-Johnson syndrome, toxic epidermal necrolysis
- **Assess allergic reactions:** itching, rash, urticaria, product should be discontinued; may need to give antihistamine

### Patient/family education

- Teach patient that therapeutic effects may take 1-4 wk, not to discontinue abruptly, that follow-up will be required
- Instruct patient to use caution in driving or other activities requiring alertness because of drowsiness, dizziness, blurred vision; to avoid rising quickly from sitting to standing, especially geriatric; to use sunscreen to prevent photosensitivity
- Caution patient to avoid alcohol ingestion, other CNS depressants
- Teach patient that decreased libido, erectile dysfunction may occur
- Advise patient not to discontinue medication quickly after long-term use: may cause nausea, headache, malaise
- Instruct patient to increase fluids, bulk in diet if constipation, urinary retention occur, especially geriatric
- Advise patient to take gum, hard sugarless candy, or frequent sips of water for dry mouth
- Teach patient to avoid all OTC products unless approved by prescriber
- Advise patient to notify prescriber if allergic reactions occur (rash, trouble breathing, itching)
- Advise patient to change positions slowly, orthostatic hypotension may occur
- Teach that suicidal thoughts, behavior may occur in young adults, children, usually during early treatment
- Inform patient to notify prescriber of worsening symptoms or if insomnia, anxiety, or depression continues
- **Serotonin syndrome:** Teach patient to report fever, sweating, diarrhea, poor coordination, nausea/vomiting, sedation, flushing, mental changes

### Evaluation

**Positive therapeutic outcome**

- Decrease in depression
- Absence of suicidal thoughts
- Decreased symptoms of OCD

## TREATMENT OF OVERDOSE:

Supportive care

## flurandrenolide topical

*See Appendix B*

## flurbiprofen ophthalmic

*See Appendix B*

**⚠ HIGH ALERT**

## flutamide (Rx)

(floo'ta-mide)

**Euflex** 🍁

*Func. class.:* Antineoplastic hormone

*Chem. class.:* Antiandrogen

F

**ACTION:** Interferes with androgen uptake in the nucleus or androgen activity in target tissues; arrests tumor growth in androgen-sensitive tissue (i.e., prostate gland)

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** Metastatic prostatic carcinoma, stage ($B_2$, C, $D_2$) $D_2$ in combination with LHRH agonistic analogs (leuprolide), $B_2$-C in combination with goserelin and radiation

## CONTRAINDICATIONS

Pregnancy, hypersensitivity

**BLACK BOX WARNING:** Severe hepatic disease

**Precautions:** G6PD deficiency, hemoglobinopathy, lactase deficiency, polycystic ovary syndrome, tobacco smoking

## DOSAGE AND ROUTES

**Adult:** PO 250 mg q8hr for a daily dose of 750 mg

**Available forms:** Caps 125, 250 🍁 mg

### Implementation

- Used in combination with LHRH agonist (leuprolide)
- Give without regard to food with a full glass of water
- Use cytotoxic handling procedures

## ADVERSE EFFECTS

**CNS:** *Hot flashes,* drowsiness, confusion, depression, anxiety, paresthesia

**GI:** *Diarrhea, nausea, vomiting,* increased liver function studies, hepatitis, anorexia, hepatotoxicity, abdominal pain, cholestasis, hepatic necrosis/failure

**GU:** *Decreased libido, impotence, gynecomastia*
**HEMA:** Leukopenia, thrombocytopenia, hemolytic anemia
**INTEG:** Irritation at site, rash, photosensitivity
**MISC:** Edema, neuromuscular and pulmonary symptoms, hypertension, secondary malignancy

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Unknown; protein binding |
| **Metabolism** | Liver |
| **Excretion** | Unknown |
| **Half-life** | 6 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Leuprolide: decreased flutamide action
Warfarin: increased PT

### Drug/lab test

Increased: LFTs, BUN, creatinine
Decreased: WBC, platelets

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Severe hepatic disease:** Monitor before start of therapy and q month × 4 months, monitor AST, ALT, alkaline phosphatase, which may be elevated; product may need to be discontinued; CBC, bilirubin, creatinine periodically

- Identify CNS symptoms: drowsiness, confusion, depression, anxiety

### Patient/family education

- Tell the patient to report side effects: decreased libido, impotence, breast enlargement, hot flashes, diarrhea, which occur when the two products are given together; also nausea, vomiting; jaundice in eyes, skin; dark urine, clay-colored stools; hepatotoxicity may occur
- Inform patient that this product is taken with leuprolide for medical castration; do not change dosing
- Advise patient to use contraception during treatment
- Teach patient to use with full glass of water, without regard to food

### Evaluation

**Positive therapeutic outcome**
- Prevention of rapid division of malignant cells

## fluticasone (Rx)

(floo-tic'a-sone)
**Flonase, Flovent HFA, Flovent Diskus, Veramyst (nasal spray)**
*Func. class.:* Corticosteroids, inhalation; antiasthmatic

**Do not confuse:** Flonase/Flovent

**ACTION:** Decreases inflammation by inhibiting mast cells, macrophages, and leukotrienes; antiinflammatory and vasoconstrictor properties

**Therapeutic outcome:** Decreased severity of asthma

**USES:** Prevention of chronic asthma during maintenance treatment in those requiring oral corticosteroids; nasal symptoms of seasonal/perennial and allergic/nonallergic rhinitis

## CONTRAINDICATIONS

Hypersensitivity to this product or milk protein, primary treatment in status asthmaticus, acute bronchospasm

**Precautions:** Pregnancy, breastfeeding, active infections, glaucoma, diabetes, immunocompromised patients, Cushing syndrome

## DOSAGE AND ROUTES

**Prevention of chronic asthma during maintenance treatment in those requiring oral corticosteroids**

**>> Flovent HFA**

**Adult and child ≥12 yr:** INH 88-440 mcg bid (in those previously taking bronchodilators alone); INH 88-220 mcg bid, max 440 mcg bid (in those previously taking inhaled corticosteroids); INH 440 mcg bid, max 880 mcg bid (in those previously taking oral corticosteroids)
**Child 4-11 yr:** INH 88 mg bid

**>> Flovent Diskus**

**Adult and child ≥12 yr:** INH 100 mcg bid, max 500 mcg bid (in those previously taking bronchodilators alone); INH 100-250 mcg bid, max 500 mcg bid (in those previously taking inhaled corticosteroids); INH 500-1000 mcg bid, max 1000 mcg bid (in those previously taking oral corticosteroids)
**Child 4-11 yr:** INH initially 50 mcg bid, max 100 mcg bid (in those previously taking bronchodilators alone or inhaled corticosteroids)

### >> Arnuity Ellipta

**Adult, child ≥ 12 yr:** INH 100 mcg via oral inhalation qday initially, may increase to 200 mcg qday after 2 wk, max 200 mcg/day

### Nasal symptoms of seasonal, perennial allergic, nonallergic rhinitis

### >> Flonase

**Adult:** Nasal 2 sprays initially, in each nostril per day or 1 spray bid, when controlled, lower to 1 spray in each nostril per day

**Adolescent/child >4 yr:** Nasal 1 spray in each nostril per day, may increase to 2 sprays in each nostril per day, when controlled, lower to 1 spray in each nostril per day

### >> Veramyst

**Adult/child ≥12 yr:** Nasal 2 sprays in each nostril per day

**Child 2-11 yr:** Nasal 1 spray in each nostril per day

**Available forms:** Oral inh aerosol 44, 110, 220 mcg; oral inh powder 50, 100, 250 mcg; nasal spray (Veramyst) 27.5 mcg/actuation, (propionate) 50 mcg/actuation, 27.5 mcg/spray (furoate); inhalation powder 100, 200 mcg/actuation (Arnuity Ellipta)

### Implementation

- Give at 1 min intervals
- Decrease dose to lowest effective dose after desired effect; decrease dose at 2- to 4-wk intervals
- Blow nose prior to use

**Inhalation route: powder for oral inhalation (Flovent Diskus)**

- Fill in the "Pouch opened" and "Use by" dates in the blank lines on the label. The "Use by" date for Flovent diskus 50 mcg is 6 wk from the date the pouch is opened. The "Use by" date for diskus 100 mcg and 250 mcg is 2 months from the date pouch is opened
- Open the diskus by holding in one hand and using the thumb of the other to push the thumbgrip away as far as it will go until the mouthpiece shows and snaps into place
- Hold and slide the lever away from the patient as far as it will go until it clicks. The number on the dose counter will count down by 1; the diskus is now ready to use
- Before inhaling the dose, have patient breathe out, hold the diskus level and away from the mouth. Breathe out into the mouthpiece
- Instruct the patient to put the mouthpiece to the lips and breathe in through the mouth quickly and deeply through the diskus. The patient should then remove the diskus from the mouth, hold breath for about 10 sec, and breathe out slowly
- After taking a dose, close the diskus by sliding the thumbgrip back as far as it will go. The diskus will click shut. The lever will automatically return to its original position
- The counter displays how many doses are left. The counter number will count down each time the patient uses the diskus. After 55 doses (23 doses from the sample pack), numbers 5 to 0 appear in red to warn that there are only a few doses left
- After use, instruct patient to rinse mouth with water and spit out the water; patient should not swallow it
- To avoid the spread of infection, do not use the inhaler for more than one person

**Intranasal**

- Prime before first use
- Shake well before each use
- Rinse tip after use, dry with tissue

## ADVERSE EFFECTS

**CNS:** Fever, headache, nervousness, dizziness, fatigue, migraines, numbness in fingers

**EENT:** *Pharyngitis,* sinusitis, rhinitis, laryngitis, hoarseness, dry eyes, cataracts, nasal discharge, epistaxis, blurred vision

**GI:** Diarrhea, abdominal pain, nausea, vomiting, *oral candidiasis,* gastroenteritis

**GU:** UTI

**INTEG:** Urticaria, dermatitis

**META:** Hyperglycemia, growth retardation in children, cushingoid features

**MISC:** Influenza, eosinophilic conditions, angioedema, Churg-Strauss syndrome, adrenal insufficiency (high doses), bone mineral density reduction

**MS:** Osteoporosis, muscle soreness, joint pain, arthralgia

**RESP:** *Upper respiratory infection,* dyspnea, cough, bronchitis, bronchospasm

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 30% aerosol, 13.5% powder |
| **Distribution** | Protein binding 91% |
| **Metabolism** | In liver after absorption in lung |
| **Excretion** | <5% in urine and feces |
| **Half-life** | 7.8 hr |

### Pharmacodynamics

| | Intranasal | INH |
|---|---|---|
| **Onset** | 12 hr | 24 hr |
| **Peak** | Several days | Several days |
| **Duration** | 1-2 wk | 1-2 wk |

## INTERACTIONS

### Individual drugs

Amprenavir, atazanavir, darunavir, delavirdine, fosamprenavir, nelfinavir, ritonavir, saquinavir: increased fluticasone levels

Isoproterenol (asthma patients): increased cardiac toxicity

Mecasermin: decreased effects of mecasermin

### Drug classifications

CYP3A4 inhibitors (ketoconazole, itraconazole): increased fluticasone levels

## NURSING CONSIDERATIONS

### Assessment

- **Assess respiratory status:** lung sounds, pulmonary function tests during and several months after change from systemic to inhalation corticosteroids
- Assess for withdrawal symptoms from oral corticosteroids: depression, pain in joints, fatigue
- **Monitor adrenal insufficiency:** nausea, weakness, fatigue, hypotension, hypoglycemia, anorexia; may occur when changing from systemic to inhalation corticosteroids; may be life-threatening
- Monitor growth rate in children; blood glucose, serum potassium in all patients
- Monitor adrenal function tests periodically: hypothalamic-pituitary-adrenal axis suppression in long-term treatment
- **Pregnancy/breastfeeding:** Use in pregnancy only if benefits outweigh risks, avoid use in breastfeeding
- **Beers:** Avoid use in older adults with or at high risk of delirium; may worsen delirium

### Patient/family education

- **Teach patient to report immediately cushingoid symptoms:** no appetite, nausea, weakness, fatigue, decreased B/P
- Teach patient how to use and when it may be empty
- Advise patient to use bronchodilator first before using inhalation, if taking both
- Caution patient not to use for acute asthmatic attack; acute asthma may require oral corticosteroids
- Advise patient to avoid smoking, smoke-filled rooms, those with URIs, those not immunized against chickenpox or measles
- Advise patient to use medical ID identifying corticosteroid use

### Evaluation

#### Positive therapeutic outcome

- Decreased severity of asthma, COPD, allergies

## fluticasone topical

*See Appendix B*

## fluvastatin (Rx)

(flu′vah-stay-tin)

**Lescol, Lescol XL**

*Func. class.:* Antilipidemic

*Chem. class.:* HMG-CoA reductase inhibitor

**ACTION:** Inhibits HMG-CoA reductase enzyme, which reduces cholesterol synthesis

**Therapeutic outcome:** Decreased cholesterol levels and LDLs, increased HDLs

**USES:** As an adjunct in primary hypercholesterolemia (types Ia, Ib), coronary atherosclerosis in CAD; secondary prevention of coronary events in patients with CAD; adjunct to diet to reduce LDL, total cholesterol, apo B levels in heterozygous familial hypercholesterolemia (LDL-C ≥190 mg/dl) or LDL-C >160 mg/dl with history of premature CV disease

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity, active liver disease

**Precautions:** Past liver disease, alcoholism, severe acute infections, trauma, hypotension, uncontrolled seizure disorders, severe metabolic disorders, electrolyte imbalance, myopathy, rhabdomyolysis

## DOSAGE AND ROUTES

**Adult:** PO 20-40 mg/day in PM initially, usual range 20-80 mg, max 80 mg; may be given in 2 doses (40 mg AM, 40 mg PM); dosage adjustments may be made in 4-wk intervals

### Heterozygous familial hypercholesterolemia

**Adolescent ≥1 yr postmenarche (10-16 yr):** PO 20 mg daily at bedtime, may increase q6wk, max 40 mg bid (cap) or 80 mg (ext rel)

**Available forms:** Caps 20, 40 mg; ext rel tab 80 mg

### Implementation

- Give without regard to food at any time of day (tab) or in the evening (cap)
- Store at room temperature, protected from light

## ADVERSE EFFECTS

**CNS:** Headache, dizziness, insomnia, confusion

**EENT:** Lens opacities

**GI:** *Nausea, constipation, diarrhea, abdominal pain, cramps, dyspepsia, flatus,* liver dysfunction, pancreatitis

**HEMA:** Thrombocytopenia, hemolytic anemia, leukopenia

**INTEG:** Rash, pruritus
**MISC:** Fatigue, influenza, photosensitivity
**MS:** Myalgia, *arthritis, arthralgia,* myositis, rhabdomyolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Steady state 4-5 wk |
| **Metabolism** | Liver |
| **Excretion** | Feces, kidneys |
| **Half-life** | 9 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Alcohol, cimetidine, ranitidine, omeprazole: increased fluvastatin effect, rifampin
Cholestyramine, colestipol: decreased fluvastatin effect; separate by ≥4 hr
Colchicine, cycloSPORINE, niacin: increased myopathy
Digoxin, phenytoin, warfarin: increased action, monitor closely
Fluconazole, itraconazole, ketoconazole: increased adverse reactions
TraMADol: increased serotonin syndrome

### Drug classifications

Fibric acid derivatives, protease inhibitors: increased myopathy, erythromycin

### Drug/herb

Red yeast rice: increased adverse reactions
Gotu kola, St. John's wort: decreased effect

### Drug/lab test

Increased: LFTs, CK
Decreased: platelets, WBC

## NURSING CONSIDERATIONS

### Assessment

- **Hypercholesterolemia:** Assess nutrition: fat, protein, carbohydrates; nutritional analysis should be completed by dietitian before treatment
- Assess fasting lipid profile (cholesterol, LDL, HDL, triglycerides) q4-6wk, then q3-6mo when stable
- Monitor bowel pattern daily; diarrhea may be a problem
- **Hepatotoxicity/pancreatitis:** Monitor liver function studies q1-2mo during the first 1½ yr of treatment; AST, ALT, liver function test results may be increased
- Monitor renal studies in patients with compromised renal system: BUN, I&O ratio, creatinine
- Obtain ophth exam before, 1 mo after treatment begins, annually; lens opacities may occur
- **Myopathy, rhabdomyolysis:** Assess for muscle pain, tenderness; obtain baseline CPK, if elevated or if symptoms occur, product should be discontinued
- **Pregnancy/breastfeeding:** Do not use in pregnancy/breastfeeding

### Patient/family education

- Inform patient that compliance is needed for positive results to occur, not to double doses
- Advise patient to notify prescriber if GI symptoms of diarrhea, abdominal or epigastric pain, nausea, vomiting, or if chills, fever, sore throat occur; also muscle pain, weakness, tenderness
- Advise patient that blood studies and eye exam will be necessary during treatment, that effect may take ≥4 wk
- Instruct patient to report suspected pregnancy, not to use during pregnancy or breastfeeding
- Advise patient that previously prescribed regimen will continue, including diet, exercise, smoking cessation
- Instruct patient to notify all health care providers of products taken
- Teach patient to take without regard to meals, to take immediate release product in the evening, to separate by ≥4 hr with bile-acid product

### Evaluation

**Positive therapeutic outcome**

- Decreased LDL, VLDL, total cholesterol levels
- Improved ratio of HDLs

## folic acid (vitamin $B_9$) (PO, OTC; IM/IV, Ph)

(foe-lik a'sid)
**Apo-Folic, Folvite, Novo-Folacid**
*Func. class.:* Vitamin B-complex group, water-soluble vitamin
*Chem. class.:* Supplement

**ACTION:** Needed for erythropoiesis; increases RBC, WBC, and platelet formation in megaloblastic anemias

**Therapeutic outcome:** Absence of macrocytic, megaloblastic anemias

**USES:** Megaloblastic or macrocytic anemia caused by folic acid deficiency; liver disease; alcoholism; hemolysis; intestinal obstruction; pregnancy; to reduce risk of neural tube defect

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, anemias other than megaloblastic/macrocytic anemia, vit $B_{12}$ deficiency anemia, uncorrected pernicious anemia

## DOSAGE AND ROUTES

### RDA

**Adult (pregnant/breastfeeding):** PO 600 mcg/day
**Adult and child ≥14 yr:** PO 400 mcg
**Child 9-13 yr:** PO 300 mcg
**Child 4-8 yr:** PO 200 mcg
**Child 1-3 yr:** PO 150 mcg
**Infant 6 mo-1 yr:** PO 80 mcg
**Neonate and infant <6 mo: PO 65 mcg**

### Megaloblastic/macrocytic anemia due to folic acid or nutritional deficiency

**Pregnant/lactating:** PO 800-1000 mcg

### Therapeutic dose

**Adult and child:** PO/IM/SUBCUT/**IV** up to 1 mg/day

### Maintenance dose

**Adult and child >4 yr:** PO/IM/**IV**/SUBCUT 0.4 mg/day
**Child <4 yr:** PO/IM/**IV**/SUBCUT up to 0.3 mg/day
**Infant:** PO/IM/**IV**/SUBCUT up to 0.1 mg/day
**Pregnant/lactating:** PO/IM/**IV**/SUBCUT 0.8-1 mg/day

### Prevention of neural tube defects during pregnancy

**Adult:** PO 0.6 mg/day

### Prevention of megaloblastic anemia during pregnancy

**Adult:** PO/IM/SUBCUT up to 1 mg/day during pregnancy

### Tropical sprue

**Adult:** PO 3-15 mg/day

**Available forms:** Tabs 0.1, 0.4, 0.8, 1, 5 mg; inj 5, 10 mg/ml

### Implementation

**SUBCUT route**
- Do not inject intradermally

**IM route**
- Inject deeply in large muscle mass, aspirate

**Direct IV route**
- Give **IV** directly, undiluted 5 mg or less over 1 min or more

**Continuous IV route**
- May be added to most **IV** sol or TPN
- Store in light-resistant container

## ADVERSE EFFECTS

**CNS:** Confusion, depression, excitability, irritability
**GI:** Anorexia, nausea, bitter taste
**INTEG:** Flushing, pruritus, rash, erythema
**RESP:** Bronchospasm
**SYST:** Anaphylaxis (rare)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Liver, crosses placenta |
| **Metabolism** | Liver (converted to active metabolite) |
| **Excretion** | Kidneys (unchanged) |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | ½-1 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

CarBAMazepine: increased need for folic acid
Fosphenytoin: decreased fosphenytoin levels, may increase seizures
Methotrexate, sulfaSALAzine, trimethoprim: decreased action of folic acid
Phenytoin: decreased phenytoin levels, may increase seizures

### Drug classifications

Estrogens, glucocorticoids, hydantoins: increased need for folic acid
Sulfonamides: decreased action of folic acid

## NURSING CONSIDERATIONS

### Assessment

- **Megaloblastic anemia:** Assess patient for fatigue, dyspnea, weakness, activity intolerance (signs of megaloblastic anemia)
- Monitor Hgb, Hct, and reticulocyte count; folate levels: 6-15 mcg/ml baseline, throughout treatment
- Assess nutritional status: bran, yeast, dried beans, nuts, fruits, fresh vegetables, asparagus; if high folic acid foods are missing from the diet, a referral to a dietitian may be indicated
- Identify products currently taken: alcohol, oral contraceptives, estrogens, methotrexate, trimethoprim, carBAMazepine, hydantoins, trimethoprim; these products may cause increased folic acid use by the body and contribute to deficiency if taking other neurotoxic products
- **Pregnancy/breastfeeding:** May use in pregnancy, breastfeeding

### Patient/family education

- Advise patient to take product exactly as prescribed; not to double doses, toxicity may occur

- Instruct patient to notify prescriber of side effects; rash or fever may indicate hypersensitivity
- Advise patient that urine may become more yellow
- Instruct patient to increase intake of foods rich in folic acid in diet as recommended by dietitian or health care provider
- Advise patient to avoid breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Absence of fatigue, weakness, dyspnea
- Absence of symptoms of megaloblastic anemia
- Increase in reticulocyte count within 5 days
- Absence of neural tube defect

**⚠ HIGH ALERT**

## fondaparinux (Rx)

(fon-dah-pair'ih-nux)

**Arixtra**

*Func. class.:* Anticoagulant, antithrombotic

*Chem. class.:* Synthetic, selective factor Xa inhibitor

**Do not confuse:** Arixtra/Anti-Xa/Arista AH

**ACTION:** Inhibits factor Xa; interrupts blood coagulation and inhibits thrombin formation; does not inactivate thrombin (activated factor II) or affect platelets

**Therapeutic outcome:** Prevention of deep vein thrombosis

**USES:** Prevention/treatment of deep vein thrombosis, pulmonary emboli in hip and knee replacement, hip fracture or abdominal surgery, acute MI, unstable angina

## CONTRAINDICATIONS

Hypersensitivity to this product; hemophilia, leukemia with bleeding, peptic ulcer disease, hemorrhagic stroke, surgery, thrombocytopenic purpura, weight <50 kg, severe renal disease (CCr <30 ml/min), active major bleeding, bacterial endocarditis

**Precautions:** Pregnancy, breastfeeding, children, geriatric, alcoholism, hepatic disease (severe), blood dyscrasias, heparin-induced thrombocytopenia, uncontrolled severe hypertension, acute nephritis, mild to moderate renal disease

**BLACK BOX WARNING:** Spinal/epidural anesthesia, lumbar puncture

## DOSAGE AND ROUTES

### Deep vein thrombosis/PE

**Adult <50 kg:** SUBCUT 5 mg/day × 5 days or more until INR is 2-3; give warfarin within 72 hr of fondaparinux

**Adult 50-100 kg:** SUBCUT 7.5 mg/day × 5 days or more until INR is 2-3; give warfarin within 72 hr of fondaparinux

**Adult >100 kg:** SUBCUT 10 mg/day × 5 days or more until INR is 2-3; give warfarin within 72 hr of fondaparinux

### Prevention of deep vein thrombosis

**Adult:** SUBCUT 2.5 mg/day, given 6 hr after surgery (hemostasis established); continue for 5-9 days; hip surgery up to 32 days; abdominal surgery up to 24 days

### Renal disease

**Adult:** Do not use if CCr <30 ml/min; CCr 30-50 ml/min, use cautiously

**Available forms:** Inj 2.5 mg/0.5 ml, 5 mg/0.4 ml, 7.5 mg/0.6 ml, 10 mg/0.8 ml prefilled syringes

### Implementation

- Do not mix with other products or solutions; cannot be used interchangeably (unit to unit) with other anticoagulants
- Give only after screening patient for bleeding disorders
- Store at 77° F (25° C); do not freeze

**SUBCUT route**

- Administer SUBCUT only; do not give IM
- Check for discolored sol or sol with particulate; if present, do not give
- Administer to recumbent patient, rotate inj sites (left/right anterolateral, left/right posterolateral abdominal wall), administer 6-8 hr after surgery
- Wipe surface of inj site with alcohol swab, twist plunger cap and remove, remove rigid needle guard by pulling straight off needle, do not aspirate, do not expel air bubble from surface
- Insert whole length of needle into skin fold held with thumb and forefinger
- When product is injected, a soft click may be felt or heard
- Give at same time each day to maintain steady blood levels
- Avoid all IM inj that may cause bleeding
- Administer only this product when ordered; not interchangeable with heparin

## ADVERSE EFFECTS

**CNS:** *Fever,* confusion, headache, dizziness, *insomnia*

**GI:** *Nausea, vomiting,* diarrhea, dyspepsia, *constipation,* increased AST, ALT
**GU:** UTI, urinary retention
**HEMA:** *Anemia,* minor bleeding, purpura, hematoma, thrombocytopenia, major bleeding (intracranial, cerebral, retroperitoneal hemorrhage), postoperative hemorrhage, heparin-induced thrombocytopenia
**INTEG:** Local reaction—*rash,* pruritus, inj site bleeding, increased wound drainage, bullous eruption
**META:** Hypokalemia
**MISC:** Hypotension, pain, *edema*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly, completely absorbed |
| **Distribution** | Blood; does not bind to plasma proteins except 94% to ATIII |
| **Excretion** | Eliminated unchanged in 72 hr in normal renal function |
| **Half-life** | 17-21 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 3 hr |
| **Duration** | Unknown |

## INTERACTIONS

Do not mix with other products or inf fluids

### Individual drugs

Abciximab, clopidogrel, dipyridamole, eptifibatide, quiNIDine, tirofiban, valproic acid, some cephalosporins: increased risk of bleeding

### Drug classifications

NSAIDs, salicylates: increased risk of bleeding

### Drug/herb

Feverfew, garlic, ginger, ginkgo, ginseng, green tea, horse chestnut, kava: increased risk of bleeding

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Monitor patients who have received epidural/spinal anesthesia or lumbar puncture for neurological impairment, including spinal hematoma, may lead to permanent disability or paralysis

- **Hemorrhage:** Assess for hemorrhage if coadministered with other products that may cause bleeding
- Assess blood studies (Hct, CBC, coagulation studies, platelets, occult blood in stools), anti-Xa; if platelets $<100{,}000/mm^3$, treatment should be discontinued; renal studies: BUN, creatinine
- **Beers:** Avoid in older adults, increased risk of bleeding, lower creatinine clearance
- Assess for bleeding: gums, petechiae, ecchymosis, black tarry stools, hematuria; notify prescriber
- **Pregnancy/breastfeeding:** Use in pregnancy only if benefits outweigh risks to the fetus, avoid use in breastfeeding, it is not known if product is excreted in breast milk

### Patient/family education

- Advise patient to use soft-bristle toothbrush to avoid bleeding gums, to use electric razor
- Advise patient to report any signs of bleeding: gums, under skin, urine, stools
- Caution patient to avoid OTC products containing aspirin, NSAIDs

### Evaluation

**Positive therapeutic outcome**
- Absence of deep vein thrombosis

## formoterol (Rx)

(for-moh'ter-ahl)
**Foradil Aerolizer, Oxeze, Perforomist**
*Func. class.:* β-Adrenergic agonist
*Chem. class.:* Sympathomimetic catecholamine

**Do not confuse:** Foradil/Toradol

**ACTION:** Has $\beta_1$ and $\beta_2$ action; relaxes bronchial smooth muscle and dilates the trachea and main bronchi by increasing levels of cyclic AMP, which relaxes smooth muscles; causes increased contractility and heart rate by acting on β-receptors in the heart

**Therapeutic outcome:** Bronchodilatation, increased heart rate and cardiac output from action on β-receptors in heart

**USES:** Maintenance, treatment of asthma, COPD, prevention of exercise-induced bronchospasm

## CONTRAINDICATIONS

Hypersensitivity to sympathomimetics, monotherapy for asthma, COPD, status asthmaticus

**Precautions:** Pregnancy, geriatric, cardiac disorders, hyperthyroidism, diabetes mellitus, prostatic hypertrophy, hypertension, African descendants

**BLACK BOX WARNING:** Asthma-related death

## DOSAGE AND ROUTES

### Maintenance, treatment of asthma

**Adult and child ≥5 yr:** INH AM and PM long-term, 1 cap (12 mcg) q12hr using aerolizer inhaler

### Maintenance of COPD

**Adult:** INH 12 mcg q12hr

### Prevention of exercise-induced bronchospasm

**Adult and child ≥12 yr:** INH prn 1 cap (12 mcg) at least 15 min before exercise, do not use additional doses for ≥12 hr

**Available forms:** INH powder in cap 12 mcg; nebulizer sol for inhalation 20 mcg/2 ml

### Implementation

- Store at room temperature; protect from heat, moisture

**Inhalation route**

- Place cap in aerolizer inhaler; the cap is punctured; do not wash aerolizer inhaler
- Pull off cover, twist mouthpiece to open, push buttons in; make sure the four pins are visible; remove cap from blister pack, place cap in chamber; twist to close, press (a click will be heard), release; patient should exhale, place inhaler in mouth, inhale rapidly

## ADVERSE EFFECTS

**CNS:** Tremors, *anxiety*, insomnia, headache, dizziness, stimulation
**CV:** Palpitations, tachycardia, hypertension, chest pain
**GI:** Nausea, vomiting, xerostomia
**RESP:** Bronchial irritation, dryness of oropharynx, bronchospasms (overuse); infection, inflammatory reactions (child)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid (INH) |
| **Distribution** | Plasma protein binding 61%-64% at concentrations of 0.1-100 ng/mL; 31%-38% at concentrations of 5-500 ng/mL |
| **Metabolism** | Liver, lungs, GI tract |
| **Excretion** | Urine, feces |
| **Half-life** | 10 hr mean terminal elimination half-life |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 5 min (INH) |
| **Duration** | Unknown |

## INTERACTIONS

Amoxapine, arsenic trioxide, chloroquine, clarithromycin, dasatinib, dolasetron, droperidol, erythromycin, halofantrine, levomethadyl, ondansetron, paliperidone, palonosetron, pentamidine, probucol, ranolazine, SUNItinib, vorinostat, pimozide, risperiDONE, ziprasidone: increased QT prolongation

### Drug classifications

Class IA/III antidysrhythmics, phenothiazines, halogenated anesthetics, tricyclics, some quinolones: increase QT prolongation
β-blockers: decreased action of formoterol
MAOIs, antidepressants (tricyclics): serious dysrhythmias
Sympathomimetics, thyroid hormones, tricyclics, some quinolones: increased action of both products
Loop/thiazide diuretics: increased hypokalemia

## NURSING CONSIDERATIONS

### Assessment

- Assess respiratory function: B/P, pulse, lung sounds, be alert for bronchospasm may occur with this patient
- Cardiac status: Assess for hypertension, palpitations, tachycardia; if CV reactions occur, product may need to be discontinued
- Assess I&O ratio; check for urinary retention, frequency, hesitancy
- Assess for paresthesias and coldness of extremities; peripheral blood flow may decrease
- **Pregnancy/breastfeeding:** Use in pregnancy only if benefits outweigh risk, use cautiously in breastfeeding

### Patient/family education

- Review package insert with patient and inform about all aspects of product
- Teach correct use of inhaler; not to swallow caps
- Teach use of spacer device in children or geriatric
- Advise patient to avoid getting aerosol in eyes
- Advise patient to wash inhaler in warm water and dry daily
- Advise patient to avoid smoking, smoke-filled rooms, persons with respiratory infections

**BLACK BOX WARNING:** Asthma-related death, severe asthma exacerbations: if wheezing worsens and cannot be relieved during an acute asthma attack, immediate medical attention should be sought

### Evaluation

**Positive therapeutic outcome**

- Absence of dyspnea, wheezing
- Improved airway exchange
- Improved ABGs

## TREATMENT OF OVERDOSE:

Administer β-blocker

## foscarnet (Rx)

(foss-kar′net)

**Foscavir**

*Func. class.:* Antiviral

*Chem. class.:* Inorganic pyrophosphate organic analog

**ACTION:** Antiviral activity is produced by selective inhibition at the pyrophosphate binding site on virus-specific DNA polymerases and reverse transcriptases at concentrations that do not affect cellular DNA polymerases

**Therapeutic outcome:** Virostatic agents against CMV retinitis

**USES:** Treatment of CMV, retinitis in patients with AIDS acyclovir-resistant, herpes simplex virus (HSV) infections; used with ganciclovir for relapsing patients

## CONTRAINDICATIONS

Hypersensitivity, CCr <0.4 ml/min/kg

**Precautions:** Pregnancy, breastfeeding, children, geriatric, seizure disorders, severe anemia

**BLACK BOX WARNING:** Nephrotoxicity electrolyte/mineral imbalances, seizures

## DOSAGE AND ROUTES

### Acyclovir-resistant mucocutaneous herpes simplex virus infection (herpes labialis, herpes febrilis, herpes genitalis) in HIV-infected patients

**Adult/adolescent (unlabeled):** **IV** 40 mg/kg q8-12hr × 2-3 wk or until lesions are healed

### Cytomegalovirus (CMV) encephalitis (unlabeled); cytomegalovirus (CMV) neurological disease (unlabeled) (including encephalitis) in HIV-infected patients

**Adult/adolescent:** **IV** 90 mg/kg q12hr or 60 mg/kg q8hr × 3 wk (or until symptomatic improvement) with ganciclovir 5 mg/kg **IV** q12hr × 2-3 wk

### Encephalitis (unlabeled) caused by human herpesvirus 6 (HHV-6) in immunocompromised patients

**Adult:** **IV** 60 mg/kg q8hr or 90 mg/kg q12hr alone or in combination with ganciclovir 5 mg/kg **IV** q12hr

### Cytomegalovirus (CMV) retinitis or disseminated disease (unlabeled) in HIV-infected patients, recurrent or relapsed cytomegalovirus (CMV) retinitis in HIV-infected patients

**Adult:** **IV** Induction with 90 mg/kg q12hr or 60 mg/kg **IV** q8hr for 14-21 days, depending upon the clinical response

### Renal dose

**Adult:** HSV induction dosage equivalent to 80 mg/kg/day (40 mg/kg IV q12hr)

**Adult:** IV CCr >1.4 ml/min/kg: no change; CCr >1-1.4 ml/min/kg: decrease to 30 mg/kg q12hr; CCr >0.8-1 ml/min/kg: decrease to 20 mg/kg q12hr; CCr >0.6-0.8 ml/min/kg: decrease to 35 mg/kg/day; CCr >0.5-0.6 ml/min/kg: decrease to 25 mg/kg/day; CCr ≥0.4-0.5 ml/min/kg: decrease to 20 mg/kg/day; CCr <0.4 ml/min/kg: not recommended

### HSV induction dosage equivalent to 120 mg/kg/day (40 mg/kg IV q8hr)

**Adult:** IV CCr >1.4 ml/min/kg: no change; CCr >1-1.4 ml/min/kg: decrease to 30 mg/kg q8hr; CCr >0.8-1 ml/min/kg: decrease to 35 mg/kg q12hr; CCr >0.6-0.8 ml/min/kg: decrease to 25 mg/kg q12hr; CCr >0.5-0.6 ml/min/kg: decrease to 40 mg/kg/day; CCr ≥0.4-0.5 ml/min/kg: decrease to 35 mg/kg/day; CCr <0.4 ml/min/kg: not recommended

### CMV induction dosage equivalent to 180 mg/kg/day (60 mg/kg q8hr)

**Adult:** IV CCr >1.4 ml/min/kg: no change; CCr >1-1.4 ml/min/kg: decrease to 45 mg/kg q8hr; CCr >0.8-1 ml/min/kg: decrease to 50 mg/kg q12hr; CCr >0.6-0.8 ml/min/kg: decrease to 40 mg/kg q12hr; CCr >0.5-0.6 ml/min/kg: decrease to 60 mg/day; CCr ≥0.4-0.5 ml/min/kg: decrease to 50 mg/kg/day; CCr <0.4 ml/min/kg: not recommended

### CMV induction dosage equivalent to 180 mg/kg/day (90 mg/kg IV q12hr)

**Adult:** IV CCr >1.4 ml/min/kg: no change; CCr >1-1.4 ml/min/kg: decrease to 70 mg/kg q12hr; CCr >0.8-1 ml/min/kg: decrease to 50 mg/kg q12hr; CCrl >0.6-0.8 ml/min/kg: decrease to 80 mg/kg/day; CCr >0.5-0.6 ml/min/kg: decrease to 60 mg/kg/day; CCr ≥0.4-0.5 ml/min/kg: decrease to 50 mg/kg/day; CCr <0.4 ml/min/kg: not recommended

**Available forms:** Inj 6000 mg/250 ml, 12,000 mg/500 ml (24 mg/ml)

### Implementation

**Intermittent IV infusion route**
- Administer increased fluids before, during product administration to induce diuresis and minimize renal toxicity
- Administer via inf pump, at no more than 1 mg/kg/min; do not give by rapid or bolus **IV;** give by central venous line or peripheral vein; standard 24 mg/ml sol may be used without dilution if using by central line; dilute the 24 mg/ml sol to 12 mg/ml with $D_5W$ or 0.9% NaCl if using peripheral vein
- Monitor patient closely during therapy; if tingling, numbness, paresthesias occur, stop inf and obtain lab sample for electrolytes

**Y-site incompatibilities:** Manufacturer recommends that product not be given with other medications in syringe or admixed

## ADVERSE EFFECTS

**CNS:** *Fever,* dizziness, *headache,* seizures, *fatigue,* neuropathy, asthenia, encephalopathy, malaise, meningitis, *paresthesia,* depression, *confusion, anxiety*

**CV:** ECG abnormalities, 1st-degree AV block, nonspecific ST-T segment changes, cerebrovascular disorder, cardiomyopathy, cardiac arrest, atrial fibrillation, HF, sinus tachycardia

**GI:** *Nausea, vomiting, diarrhea, anorexia,* abdominal pain, pancreatitis

**GU:** Acute renal failure, decreased CCr and increased serum creatinine, azotemia, diabetes mellitus

**HEMA:** Anemia, granulocytopenia, leukopenia, thrombocytopenia, thrombosis, lymphadenopathy, neutropenia

**INTEG:** *Rash,* sweating, pruritus, skin discoloration

**RESP:** *Coughing, dyspnea,* pneumonia, pulmonary infiltration, pneumothorax, hemoptysis

**SYST:** *Hypokalemia, hypocalcemia, hypomagnesemia,* hypophosphatemia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete (**IV**) |
| **Distribution** | 14%-17% plasma protein binding |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys (79%-92%) unchanged, breast milk |
| **Half-life** | 18-88 hr; increased in renal disease |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 48 hr |
| **Peak** | 2 wk |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Acyclovir, cidofovir, CISplatin, tacrolimus, tenofovir, vancomycin, amphotericin B, cycloSPORINE, calcium products (decreases ionized calcium), lithium: increased nephrotoxicity

Pentamidine: increased hypocalcemia

### Drug classifications

**BLACK BOX WARNING:** Aminoglycosides, gold compounds, NSAIDs: increased nephrotoxicity

## NURSING CONSIDERATIONS

### Assessment

- **General** culture should be done before treatment with foscarnet is begun; cultures of blood, urine, and throat may all be taken; CMV is not confirmed by this method; the diagnosis is made by an ophth exam

**BLACK BOX WARNING: Renal tubular disorders:** Assess kidney: BUN, serum creatinine, creatinine clearance, if CCr <0.4 ml/min/kg, discontinue product, provide adequate hydration before and during infusion to prevent toxicity

- Blood counts should be done q2wk; watch for decreasing granulocytes, Hgb; if low, therapy may have to be discontinued and restarted after hematologic recovery; blood transfusions may be required
- Assess for GI symptoms: severe nausea, vomiting, diarrhea; severe symptoms may necessitate discontinuing product
- **Seizures:** May be caused by alterations in minerals and electrolytes, monitor electrolytes and minerals: calcium, phosphorous, magnesium, sodium, potassium; watch closely for tetany during first administration
- Assess for symptoms of blood dyscrasias (anemia, granulocytopenia); bruising, fatigue, bleeding, poor healing
- **Assess for symptoms of allergic reactions:** flushing, rash, urticaria, pruritus
- **CMV retinitis:** Ophthalmic exam should confirm diagnosis

### Patient/family education

- Advise patient to notify prescriber if sore throat, swollen lymph nodes, malaise, fever occur; may indicate presence of other infections

• **Pregnancy/breastfeeding:** Use cautiously in pregnancy only if clearly needed, do not breastfeed
• Advise patient to report perioral tingling, numbness in extremities, and paresthesias; inf should be stopped and electrolytes should be requested
• Caution patient that serious product interactions may occur if OTC products are ingested; check first with prescriber
• Inform patient that product is not a cure but will control symptoms
• Advise patient that ophth exams must be continued

### Evaluation

**Positive therapeutic outcome**
• Improvement in CMV retinitis

## fosinopril (Rx)

(foss-in-o′pril)
Func. class.: Antihypertensive
*Chem. class.:* Angiotensin-converting enzyme (ACE) inhibitor

**Do not confuse:** Monopril/minoxidil/Monurol

**ACTION:** Selectively suppresses renin-angiotensin-aldosterone system; inhibits ACE; prevents conversion of angiotensin I to angiotensin II; results in dilatation of arterial, venous vessels

**Therapeutic outcome:** Decreased B/P in hypertension

**USES:** Hypertension, alone or in combination with thiazide diuretics, systolic HF

## CONTRAINDICATIONS

Breastfeeding, children, hypersensitivity to ACE inhibitors, history of ACE inhibitor–induced angioedema

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Geriatric, impaired liver function, hypovolemia, blood dyscrasias, HF, COPD, asthma, angioedema, hyperkalemia, renal artery stenosis, renal disease, aortic stenosis, autoimmune disorders, collagen vascular disease, febrile illness, Black patients

## DOSAGE AND ROUTES

### Hypertension

**Adult:** PO 5-10 mg/day initially, then 20-40 mg/day divided bid or daily, max 80 mg/day

### HF

**Adult:** PO 10 mg/day, then up to 40 mg/day, increased over several weeks; use lower dose in those undergoing diuresis before fosinopril

**Available forms:** Tabs 10, 20, 40 mg

### Implementation

• Store in tight container at 86° F (30° C)
• Severe hypotension may occur after 1st dose of this medication; hypotension may be prevented by reducing or discontinuing diuretic therapy 3 days before beginning benazepril therapy

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness,* fatigue, syncope
**CV:** *Hypotension,* orthostatic hypotension, tachycardia
**GI:** *Nausea,* constipation, *vomiting,* diarrhea, hepatotoxicity, cholestatic jaundice, fulminant hepatic necrosis, hepatic failure, death
**GU:** Increased BUN, creatinine, azotemia, renal artery stenosis
**HEMA:** Decreased Hct, Hgb, eosinophilia, leukopenia, neutropenia, agranulocytosis
**META:** *Hyperkalemia*
**RESP:** *Cough*
**SYST:** Anaphylaxis, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 30% |
| **Distribution** | Crosses placenta |
| **Metabolism** | Liver, converted to fosinoprilat |
| **Excretion** | 50% kidneys (metabolites), 50% feces |
| **Half-life** | 12 hr: fosinoprilat |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 1 hr |
| **Peak** | 2-6 hr |
| **Duration** | 24 hr |

## INTERACTIONS

### Individual drugs

Alcohol (acute ingestion): increased hypotension (large amounts)
Digoxin, hydrALAZINE, lithium, prazosin: increased toxicity

### Drug classifications

Adrenergic blockers, antihypertensives, diuretics, ganglionic blockers, nitrates: increased hypotension
Antacids: decreased absorption
Diuretics (potassium-sparing), sympathomimetics, NSAIDs, vasodilators: increased toxicity
Salicylates: decreased antihypertensive effect

### Drug/herb
Hawthorn: increased antihypertensive effect
Ephedra: decreased antihypertensive effect

### Drug/lab test
Increased: AST, ALT, alkaline phosphatase, glucose, bilirubin, uric acid, BUN, potassium
Positive: ANA titer
False positive: urine acetone

## NURSING CONSIDERATIONS
### Assessment
- **Hypertension:** Monitor B/P, check for orthostatic hypotension, syncope; if changes occur, dosage change may be required
- **Collagen vascular disease:** Monitor blood studies: neutrophils, decreased platelets; obtain WBC with differential at baseline and qmo × 6 mo, then q2-3mo × 1 yr; if neutrophils <1000/mm$^3$, discontinue
- Monitor renal studies: protein, BUN, creatinine; watch for increased levels that may indicate nephrotic syndrome and renal failure; monitor urine daily for protein; monitor renal symptoms: polyuria, oliguria, frequency, dysuria
- Establish baselines in renal, liver function tests before therapy begins
- Check potassium levels throughout treatment
- **HF:** Check for edema in feet, legs daily, monitor weight daily
- **Assess for allergic reactions:** rash, fever, pruritus, urticaria; product should be discontinued if antihistamines fail to help
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education
- Advise patient not to discontinue product abruptly; warn patient to tell all persons associated with his or her care
- Teach patient not to use OTC products (cough, cold, allergy) unless directed by prescriber because serious side effects can occur; xanthines such as coffee, tea, chocolate, cola can prevent action of product
- Teach patient the importance of complying with dosage schedule, even if feeling better; to continue with medical regimen to decrease B/P: exercise, smoking cessation, decreasing stress, diet modifications
- Emphasize the need to rise slowly to sitting or standing position to minimize orthostatic hypotension; not to exercise in hot weather or increased hypotension can occur
- Advise patient to notify prescriber of mouth sores, sore throat, fever, swelling of hands or feet, irregular heartbeat, chest pain, coughing, shortness of breath
- Instruct patient to report excessive perspiration, dehydration, vomiting, diarrhea; may lead to fall in B/P
- Caution patient that product may cause dizziness, fainting, light-headedness; may occur during 1st few days of therapy; to avoid activities that may be hazardous
- Teach patient how to take B/P, normal readings for age-group

**BLACK BOX WARNING:** Advise patient to notify prescriber if pregnancy is planned or suspected, to use contraception during treatment

### Evaluation
**Positive therapeutic outcome**
- Decreased B/P in hypertension

## TREATMENT OF OVERDOSE:
0.9% NaCl **IV** inf, hemodialysis

## fosphenytoin (Rx)
(foss-fen'i-toy-in)
**Cerebyx**
*Func. class.:* Anticonvulsant
*Chem. class.:* Hydantoin, phosphate phenytoin ester

**ACTION:** Inhibits spread of seizure activity in motor cortex by altering ion transport; increases AV conduction; prodrug of phenytoin

**Therapeutic outcome:** Decreased seizures, absence of dysrhythmias

**USES:** Generalized tonic-clonic seizures, status epilepticus, partial seizures

## CONTRAINDICATIONS
Pregnancy, hypersensitivity, bradycardia, SA and AV block, Stokes-Adams syndrome

**Precautions:** Breastfeeding, allergies, renal/hepatic disease, myocardial insufficiency, hypoalbuminemia, hypothyroidism, Asian patients positive for HLA-B 1502, abrupt discontinuation, agranulocytosis, alcoholism, carBAMazepine/barbiturate hypersensitivity, bone marrow suppression, CAD, geriatrics, hemolytic anemia, hyponatremia, methemoglobinemia, myasthenia gravis, psychosis, suicidal ideation

**BLACK BOX WARNING:** Dysrhythmias, hypotension (rapid IV infusion)

## DOSAGE AND ROUTES
All doses in PE (phenytoin sodium equivalent)

### Status epilepticus
**Adult and adolescent: IV** 15-20 mg PE/kg

### Nonemergency/maintenance dosing
**Adult and adolescent >16 yr: IM/IV** 10-20 mg PE/kg 10 mg dose; 4-6 mg PE/kg/day (maintenance); start maintenance 12 hr after loading dose; give in 2-3 divided doses

**Available forms:** Inj 150 mg (100 mg PE), 750 mg (500 mg PE), 50 mg/ml vials

### Implementation
**Injectable routes**
- Give IM/IV; the dosage, concentration, and infusion rate of fosphenytoin should always be expressed, prescribed, and dispensed in phenytoin sodium equivalents (PE); exercise extreme caution when preparing and administering fosphenytoin; the concentration and dosage should be carefully confirmed; fatal overdoses have occurred in children when the per-ml concentration of the product (50 mg PE/mL) was misinterpreted as the total amount of drug in the vial
- Visually inspect for particulate matter and discoloration prior to use

**IV infusion route**
- Prior to infusion, dilute in 5% dextrose or 0.9% saline solution to a concentration ranging from 1.5-25 mg PE/ml

**BLACK BOX WARNING:** Because of the risk of hypotension, do not exceed recommended infusion rates. Continuous monitoring of ECG, B/P, and respiratory function is recommended, especially throughout the period when phenytoin concentrations peak (about 10-20 min after the end of the infusion)

- Loading doses should always be followed by maintenance doses of oral or parenteral phenytoin or parenteral fosphenytoin

**BLACK BOX WARNING:** Adult: Infuse IV at a rate max 150 mg PE/min

- Elderly or debilitated adult: infuse IV at a max 3 mg PE/kg/min or 150 mg PE/min, whichever is less

**BLACK BOX WARNING:** Child: infuse IV at a rate of 0.5-3 mg PE/kg/min, max 150 mg PE/min, whichever is less

**BLACK BOX WARNING:** Infant, neonate: infuse IV at a rate max 0.5-3 mg PE/kg/min

**Y-site compatibilities:** Aminocaproic acid, amphotericin B lipid complex, amphotericin B liposome, anidulafungin, atenolol, bivalirudin, bleomycin, CARBOplatin, CISplatin, cyclophosphamide, cytarabine, DACTINomycin, DAPTOmycin, dexmedetomidine, dilTIAZem, DOCEtaxel, doxacurium, eptifibatide, ertapenem, etoposide, fludarabine, fluorouracil, gatifloxacin, gemcitabine, gemtuzumab, granisetron, ifosfamide, levofloxacin, linezolid, LORazepam, mechlorethamine, meperidine, methotrexate, metroNIDAZOLE, nesiritide, octreotide, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pantoprazole, PEMEtrexed, PHENobarbital, piperacillin-tazobactam, rocuronium, sodium acetate, tacrolimus, teniposide, thiotepa, tigecycline, tirofiban, vinCRIStine, vinorelbine, voriconazole, zoledronic acid

**Y-site incompatibilities:** Caspofungin, DOXOrubicin, epirubicin, fenoldopam, IDArubicin, midazolam, mitoXANTRONE, mycophenolate, quinupristin-dalfopristin

## ADVERSE EFFECTS
**CNS:** *Drowsiness,* dizziness, insomnia, paresthesias, depression, suicidal tendencies, aggression, headache, confusion, paresthesia, emotional lability, syncope, cerebral edema
**CV:** Hypotension, hypertension, HF, shock, dysrhythmias
**EENT:** Nystagmus, diplopia, blurred vision
**GI:** Nausea, vomiting, diarrhea, constipation, anorexia, weight loss, hepatitis, jaundice, gingival hyperplasia
**HEMA:** Agranulocytosis, leukopenia, aplastic anemia, thrombocytopenia, megaloblastic anemia
**INTEG:** Rash, lupus erythematosus, Stevens-Johnson syndrome, hirsutism, hypersensitivity, pruritus
**RESP:** Bronchospasm, cough
**SYST:** Hyperglycemia, hypokalemia, toxic epidermal necrolysis HLA-B (Asian patients positive for HLA-B 1502), DRESS, purple glove syndrome, anaphylaxis

### Pharmacokinetics
| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 99% |
| **Metabolism** | Liver: converted to phenytoin |
| **Excretion** | Kidneys |
| **Half-life** | Unknown |

### Pharmacodynamics
Unknown

## INTERACTIONS
### Individual drugs
Alcohol: decreased effects of fosphenytoin (chronic use)

Amiodarone, chloramphenicol, cimetidine: increased fosphenytoin level
CarBAMazepine, folic acid, rifampin, theophylline, tramadol: decreased effects of fosphenytoin
Delavirdine: do not use concurrently; decreased virologic response, resistance

### Drug classifications

Antacids, antihistamines, antineoplastics, CYP1A2 inducers: decreased effects of fosphenytoin
Antidepressants (tricyclics), CYP1A2 inhibitors, estrogens, $H_2$-receptor antagonists, phenothiazines, salicylates, sulfonamides: increased fosphenytoin level

### Drug/herb

Ginseng, valerian: decreased anticonvulsant effect
Ginkgo: increased anticonvulsant effect

### Drug/lab test

Increased: glucose, alkaline phosphatase
Decreased: dexamethasone, metyrapone test serum, PBI, urinary steroids, potassium

## NURSING CONSIDERATIONS

### Assessment

- Assess drug level: target level 10-20 mcg/ml; toxic level 30-50 mcg/ml, wait at least 2 hr after dose before testing, 4 hr after IM dose
- Assess seizure activity including type, location, duration, and character; provide seizure precaution
- Assess renal studies: urinalysis, BUN, urine creatinine
- Monitor hepatic studies: ALT, AST, bilirubin, creatinine
- Assess allergic reaction: red raised rash; if this occurs, product should be discontinued
- **Monitor for toxicity:** bone marrow depression, nausea, vomiting, ataxia, diplopia, cardiovascular collapse, slurred speech, confusion
- **Pregnancy/breastfeeding:** Do not use in pregnancy, birth defects have occurred, avoid breastfeeding
- Assess product level: toxic level 30-50 mcg/ml
- Assess for rash, discontinue as soon as rash develops, serious adverse reactions such as Stevens-Johnson syndrome can occur
- **Assess mental status:** mood, sensorium, affect, memory (long, short), especially geriatric; suicidal thoughts/behaviors
- **Serious skin reactions:** usually occurring within 28 days of treatment; if a rash develops, patient should be evaluated for DRESS
- **Assess for blood dyscrasias:** fever, sore throat, bruising, rash, jaundice, epistaxis (long-term treatment only)
- Monitor blood studies: RBC, Hct, Hgb, reticulocyte counts weekly for 4 wk, then monthly; also check thyroid function tests, serum calcium, albumin, phosphorus, potassium

### Patient/family education

- Teach patient the reason for and expected outcome of treatment
- Instruct patient not to use machinery or engage in hazardous activity; drowsiness, dizziness may occur
- Advise patient to carry/wear emergency ID identifying product used, name of prescriber
- Advise patient to notify prescriber of rash, bleeding, bruising, slurred speech, jaundice of skin or eyes, joint pain, nausea, vomiting, severe headache, depression, suicidal ideation
- Advise patient to keep all medical appointments, including lab work, physical assessment
- Advise patient to notify prescriber if pregnancy is planned or suspected; to use contraception with this product; not to use in pregnancy, avoid breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Decreased seizure activity

## frovatriptan (Rx)

(froh-vah-trip'tan)

**Frova**

*Func. class.:* Antimigraine agent
*Chem. class.:* 5-$HT_1$ receptor agonist

**ACTION:** Binds selectively to the vascular 5-$HT_{1B}$, 5-$HT_{1D}$ receptor subtypes, exerts antimigraine effect; binds to benzodiazepine receptor sites, causes vasoconstriction in cranium

**Therapeutic outcome:** Absence of migraines

**USES:** Acute treatment of migraine with or without aura

## CONTRAINDICATIONS

Angina pectoris, history of MI, documented silent ischemia, Prinzmetal's angina, ischemic heart disease, concurrent ergotamine-containing preparations, uncontrolled hypertension, hypersensitivity, basilar or hemiplegic migraine; ischemic bowel disease; peripheral vascular disease, severe hepatic disease, prophylactic migraine treatment

**Precautions:** Pregnancy, breastfeeding, children, geriatric, postmenopausal women, men >40 yr, risk factors for CAD, hypercholesterolemia, obesity, diabetes, impaired hepatic function, seizure disorder

## DOSAGE AND ROUTES

**Adult:** PO 2.5 mg; a 2nd dose may be taken after ≥2 hr; max 3 tabs/day (7.5 mg)

**Available forms:** Tabs 2.5 mg

### Implementation

- Ensure that tablets are swallowed whole
- Provide quiet, calm environment with decreased stimulation from noise, bright light, excessive talking

## ADVERSE EFFECTS

**CNS:** *Hot sensation,* paresthesia, *dizziness,* headache, fatigue, cold sensation, insomnia, anxiety, somnolence, seizures
**CV:** *Flushing,* chest pain, palpitation, coronary artery vasospasm, MI, myocardial ischemia, ventricular tachycardia, ventricular fibrillation
**GI:** Dry mouth, dyspepsia, abdominal pain, diarrhea, vomiting, nausea
**MS:** Skeletal pain

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Absolute bioavailability of PO dose ~20% in males, 30% in females |
| **Distribution** | Protein binding 15%; reversibly bound to blood cells at equilibrium 60% |
| **Metabolism** | Liver, by CYP1A2 |
| **Excretion** | Urine (32%), feces (62%) |
| **Half-life** | 25-29 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 10 min-2 hr |
| **Peak** | 2-4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Estrogen, propranolol: increased effects of frovatriptan

### Drug classifications

CYP1A2 inhibitors (cimetidine, ciprofloxacin, erythromycin), hormonal contraceptives: increased frovatriptan levels
Selective serotonin reuptake inhibitors, other serotonin agonists (dextromethorphan, antidepressants): increased toxicity, MAOIs

## NURSING CONSIDERATIONS

### Assessment

- **Migraine:** aura, alleviating/exacerbating factor, diet, character
- Assess for ingestion of tyramine-containing foods (pickled products, beer, wine, aged cheese), food additives, preservatives, colorings, artificial sweeteners, chocolate, caffeine, which may precipitate these types of headaches
- **Serious cardiac reactions:** May occur within a few hours of taking a 5-HT1 agonist, dysrhythmias, ventricular fibrillation leading to death
- **Serotonin syndrome:** Assess for agitation, confusion, diaphoresis, increased B/P, nausea, vomiting, diarrhea, product should be discontinued
- Assess B/P; signs/symptoms of coronary vasospasms
- Assess for stress level, activity, recreation, coping mechanisms
- Assess neurologic status: LOC, paresthesia, hot/cold sensations, dizziness, headache, fatigue
- **Pregnancy/breastfeeding:** Use only if benefits outweigh risk to the fetus, do not breastfeed

### Patient/family education

- Instruct patient to report any side effects to prescriber
- Advise patient that photosensitivity may occur, to use sunscreen and wear protective clothing when outdoors
- Advise patient to have dark, quiet environment available
- **Serotonin syndrome:** Teach patient to report immediately agitation, confusion, sweating, nausea, vomiting, diarrhea
- **Serious cardiac reactions:** Advise patient to report immediately pain, chest tightness

### Evaluation

**Positive therapeutic outcome**

- Decrease in frequency, severity of migraine

## TREATMENT OF OVERDOSE:

No specific antidote; monitor patient closely for ≥48 hr, treat any symptoms as necessary

**furosemide (Rx)**
(fur-oh'se-mide)
**Lasix**
*Func. class.:* Loop diuretic
*Chem. class.:* Sulfonamide derivative

**Do not confuse:** furosemide/torsemide, Lasix/Lanoxin/Lomotil/Losec/Luvox

**ACTION:** Acts on the ascending loop of Henle in the kidney, inhibiting reabsorption of electrolytes sodium and chloride, causing excretion of sodium, calcium, magnesium, chloride, water, and some potassium; decreases reabsorption of sodium and chloride and increases excretion of potassium in the distal tubule of the kidney; responsible for slight

antihypertensive effect and peripheral vasodilatation

**Therapeutic outcome:** Decreased edema in lung tissue, peripherally; decreased B/P

**USES:** Pulmonary edema, edema in HF, nephrotic syndrome, ascites, hepatic disease, hypertension

**Unlabeled uses:** Hypercalcemia in malignancy

## CONTRAINDICATIONS

Anuria, hypovolemia

**Precautions:** Pregnancy, diabetes mellitus, dehydration, severe renal disease, cirrhosis, ascites, hypersensitivity to sulfonamides, breastfeeding, infants, electrolyte depletion

## DOSAGE AND ROUTES

**Adult:** PO 20-80 mg/day in AM, may give another dose in 6 hr, up to 600 mg/day; IM/**IV** 20-40 mg, increased by 20 mg q2hr until desired response
**Child:** PO/IM/**IV** 1-2 mg/kg, may increase by 1-2 mg/kg/q6-8hr up to 6 mg/kg

### Antihypercalcemia

**Adult:** IM/**IV** 80-100 mg q1-4hr or PO 120 mg/day or divided bid
**Child:** IM/**IV** 25-50 mg, repeat q4hr if needed

### Acute/chronic renal failure

**Adult:** PO 80 mg/day, increase by 80-120 mg/day to desired response; **IV** 100-200 mg, max 600-800 mg

**Available forms:** Tabs 20, 40, 80 mg; oral sol 8 mg/ml, 10 mg/ml; inj IM, **IV** 10 mg/ml

### Implementation

- Give in AM to avoid interference with sleep
- Potassium replacement if potassium level is <3.0 mg/dl; product may be crushed if patient is unable to swallow

**PO route**

- With food or milk or use oral sol if nausea occurs; absorption may be reduced slightly

**IV route**

- Do not use sol that is yellow, has a precipitate or crystals

**IV, direct route**

- Give undiluted through Y-tube on 3-way stopcock; give 20 mg or less/min

**Intermittent IV inf route**

- May be added to 0.9% NaCl, $D_5W$, use within 24 hr to ensure compatibility; give through Y-tube or 3-way stopcock; give at 4 mg/min or less, use inf pump

**Y-site compatibilities:** Acyclovir, alfentanil, allopurinol, alprostadil, amifostine, amikacin, aminocaproic acid, aminophylline, amphotericin B cholesteryl/lipid complex/liposome, anidulafungin, argatroban, ascorbic acid, atenolol, atropine, azaTHIOprine, aztreonam, bivalirudin, bleomycin, bumetanide, calcium chloride/gluconate, CARBOplatin, cefamandole, ceFAZolin, cefepime, cefonicid, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, ceftobiprole, cefTRIAXone, cefuroxime, chloramphenicol, CISplatin, cladribine, clindamycin, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, digoxin, DOCEtaxel, doripenem, doxacurium, DOXOrubicin liposome, enalaprilat, ePHEDrine, EPINEPHrine, etoposide, fentaNYL, fludarabine, fluorouracil, folic acid, foscarnet, gallium nitrate, ganciclovir, granisetron, heparin, hydrocortisone, HYDROmorphone, ifosfamide, imipenem-cilastatin, indomethacin, insulin (regular), isosorbide, kanamycin, leucovorin, lidocaine, linezolid, LORazepam, LR, mannitol, mechlorethamine, melphalan, meropenem, methicillin, methotrexate, methylPREDNISolone, metoprolol, metroNIDAZOLE, mezlocillin, micafungin, miconazole, mitoMYcin, moxalactam, multiple vitamins injection, nafcillin, naloxone, nitroprusside, octreotide, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pantoprazole, PEMEtrexed, penicillin G, PENTobarbital, PHENobarbital, phytonadione, piperacillin, piperacillin-tazobactam, potassium chloride, procainamide, propofol, propranolol, ranitidine, remifentanil, Ringer's, ritodrine, sargramostim, sodium acetate/bicarbonate, succinylcholine, SUFentanil, temocillin, teniposide, theophylline, thiopental, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA, tobramycin, urokinase, vit B/C, voriconazole, zoledronic acid

**Y-site incompatibilities:** Amsacrine, bleomycin, DOXOrubicin, droperidol, esmolol, fluconazole, gentamicin, IDArubicin, metoclopramide, milrinone, netilmicin, ondansetron, quiNIDine, vinBLAStine, vinCRIStine

## ADVERSE EFFECTS

**CNS:** Headache, fatigue, weakness, vertigo, paresthesias
**CV:** Orthostatic hypotension, chest pain, ECG changes, circulatory collapse
**EENT:** *Loss of hearing,* ear pain, tinnitus, blurred vision
**ELECT:** *Hypokalemia, hypochloremic alkalosis, hypomagnesemia, hyperuricemia, hypocalcemia, hyponatremia,* metabolic alkalosis

**ENDO:** *Hyperglycemia*
**GI:** *Nausea,* diarrhea, dry mouth, vomiting, anorexia, cramps, oral or gastric irritations, pancreatitis
**GU:** *Polyuria,* renal failure, *glycosuria,* bladder spasms
**HEMA:** Thrombocytopenia, agranulocytosis, leukopenia, neutropenia, anemia
**INTEG:** *Rash, pruritus, purpura,* sweating, photosensitivity, urticaria
**MS:** Cramps, stiffness
**SYST:** Toxic epidermal necrolysis, erythema muliforme, Stevens-Johnson syndrome

### Pharmacokinetics

| | PO |
|---|---|
| **Absorption** | GI tract (60%-70%) |
| | **PO/IM/IV** |
| **Distribution** | Crosses placenta |
| **Metabolism** | Liver (30%-40%) |
| **Excretion** | Breast milk, urine, feces |
| **Half-life** | ½-1 hr |

### Pharmacodynamics

| | PO | IM | IV |
|---|---|---|---|
| **Onset** | 1 hr | ½ hr | 5 min |
| **Peak** | 1-2 hr | Unknown | ½ hr |
| **Duration** | 6-8 hr | 4-8 hr | 2 hr |

## INTERACTIONS

### Individual drugs

CISplatin, vancomycin: increased risk of ototoxicity
Digoxin: increased toxicity
Lithium: decreased renal clearance, causing increased toxicity
Probenecid: decreased furosemide effect

### Drug classifications

Aminoglycosides: increased ototoxicity
Anticoagulants, salicylates: increased effects
Antihypertensives: increased antihypertensive effect
Nitrates: increased hypotensive action
Nondepolarizing skeletal muscle relaxants, salicylates, aminoglycosides, CISplatin: increased toxicity

### Drug/lab test

Interference: GTT
Increase: LDL

## NURSING CONSIDERATIONS

### Assessment

- **Ototoxicity:** Assess patient for tinnitus, hearing loss, ear pain; periodic testing of hearing is needed when high doses of this product are given by **IV** route
- **Hypokalemia:** acidic urine, reduced urine osmolality, nocturia, polyuria and polydipsia; hypotension, broad T-wave, U-wave, ectopy, tachycardia, weak pulse; muscle weakness, altered LOC, drowsiness, apathy, lethargy, confusion, depression; anorexia, nausea, cramps, constipation, distention, paralytic ileus; hypoventilation, respiratory muscle weakness
- Monitor for CV, GI, neurologic manifestations of hyponatremia: increased B/P, cold, clammy skin, hypovolemia or hypervolemia; anorexia, nausea, vomiting, diarrhea, abdominal cramps; lethargy, increased ICP, confusion, headache, seizures, coma, fatigue, tremors, hyperreflexia
- Monitor for neurologic, respiratory manifestations of hyperchloremia: weakness, lethargy, coma; deep rapid breathing
- **HF:** Assess fluid volume status: I&O ratios and record, count or weigh diapers as appropriate, weight, distended red veins, crackles in lung, color, quality, and specific gravity of urine, skin turgor, adequacy of pulses, moist mucous membranes, bilateral lung sounds, peripheral pitting edema; dehydration symptoms of decreasing output, thirst, hypotension, dry mouth and mucous membranes should be reported
- Monitor electrolytes: potassium, sodium, chloride, magnesium; also include BUN, blood pH, ABGs, uric acid, CBC, blood glucose
- **Hypertension:** Assess B/P before and during therapy lying, standing, and sitting as appropriate; orthostatic hypotension can occur rapidly
- **Beers:** Use with caution in older adults, may exacerbate or cause syndrome of inappropriate antidiuretic hormone secretion or hyponatremia, monitor sodium level closely when changing dose
- **Serious rash:** Monitor for skin rash often, Stevens-Johnson syndrome, toxic epidermal necrolysis, erythema multiforme may occur and is life threatening
- **Pregnancy/lactation:** Use only if benefits outweigh risks to the fetus, use cautiously in breastfeeding, excreted in breast milk

### Patient/family education

- Teach patient to take the medication early in the day to prevent nocturia
- Instruct the patient to take with food or milk if GI symptoms of nausea and anorexia occur
- Teach patient to maintain a record of weight on a weekly basis and notify physician of weight loss of >5 lb
- Caution the patient that this product causes a loss of potassium, that food rich in potassium should be added to the diet; refer to a dietitian for assistance in planning
- Caution the patient to rise slowly from sitting or reclining positions, not to exercise in hot

weather or stand for prolonged periods because orthostatic hypotension will be enhanced; lie down if dizziness occurs
• Advise patient to wear protective clothing and sunscreen to prevent photosensitivity
• Caution patient not to use alcohol or any OTC medications without physician's approval; serious product reactions may occur
• Emphasize the need to contact physician immediately if muscle cramps, weakness, nausea, dizziness, or numbness occurs
• Teach patient to take and record own B/P and pulse
• Advise patient to continue taking medication even if feeling better; this product controls symptoms but does not cure the condition
• Advise the patient with hypertension to continue other medical treatment (exercise, weight loss, relaxation techniques, cessation of smoking)
• Teach patient to contact prescriber if rash, cramps, nausea, dizziness, numbness, weakness occur

## Evaluation

### Positive therapeutic outcome

• Decreased edema
• Decreased B/P
• Lowered calcium level in malignancy
• Increased diuresis

famciclovir (Rx)
felodipine (Rx)
fentaNYL transdermal (Rx)
fentaNYL SL
ferrous fumarate (Rx)
carbonyl iron (OTC)
fexofenadine (Rx, OTC)
finasteride (Rx)
fludrocortisone (Rx)
fluocinolone topical
FLUoxetine (Rx)
flutamide (Rx)
fluvastatin (Rx)

formoterol (Rx)
fosphenytoin (Rx)

famotidine (Rx, OTC)
fenofibrate (Rx)
fentaNYL nasal spray (Rx)
fentaNYL buccal
ferrous gluconate (Rx)
iron polysaccharide (OTC)
fidaxomicin (Rx)
fingolimod (Rx)
flumazenil (Rx)
fluorometholone ophthalmic
flurandrenolide topical
fluticasone (Rx)
folic acid (vitamin $B_9$) (PO, OTC; IM/IV, Ph)
foscarnet (Rx)
frovatriptan (Rx)

febuxostat (Rx)
fentaNYL (Rx)
fentaNYL SL spray (Rx)
fentaNYL lozenge
ferrous sulfate (Rx)
fesoterodine (Rx)
filgrastim (Rx)
fluconazole (Rx)
flunisolide nasal agent
fluorouracil (Rx)
flurbiprofen ophthalmic
fluticasone topical
fondaparinux (Rx)

fosinopril (Rx)
furosemide (Rx)

## gabapentin (Rx)

(gab'a-pen-tin)
**Gralise, Horizant, Neurontin**
*Func. class.:* Anticonvulsant
*Chem. class.:* GABA analogue

**Do not confuse:** Neurontin/Noroxin/Neoral

**ACTION:** Mechanism unknown; may increase seizure threshold; structurally similar to GABA, but does not bind to GABAa or GABAb; gabapentin binding sites in neocortex, hippocampus

**Therapeutic outcome:** Decreased seizure activity

**USES:** Adjunct treatment of partial seizures, with or without generalization in patients >12 yr; adjunct in partial seizures in children 3-12 yr, postherpetic neuralgia, primary restless leg syndrome (RLS) in adults

**Unlabeled uses:** Neuropathic pain, bipolar disorder, migraine prophylaxis, fibromyalgia

## CONTRAINDICATIONS

Hypersensitivity to this product

**Precautions:** Pregnancy, breastfeeding, children <3 yr, geriatric, renal disease, hemodialysis, suicidal thoughts, depression

## DOSAGE AND ROUTES

### Seizures with or without secondary generalized tonic-clonic seizures (Neurontin only)

**Adult and child >12 yr:** PO 900-1800 mg/day in 3 divided doses; may titrate to 1800 mg/day
**Child 3-12 yr:** PO 10-15 mg/kg/day in 3 divided doses, initially titrate dose upward over approximately 3 days; if >5 yr old, 40 mg/kg/day in 3 divided doses; all given in 3 divided doses

### Postherpetic neuralgia

**Adult:** PO (Neurontin) 300 mg on day 1, 600 mg/day divided bid on day 2, 900 mg/day divided tid on day 3, may titrate to 1800-3600 mg divided tid if needed; ext rel tab (Gralise only) 300 mg on day 1, then 600 mg on day 2, 900 mg on days 3-6, 1200 mg on days 7-10, 1500 mg on days 11-14, 1800 mg on day 15 and thereafter; Horizant only: 600 mg in AM × 3 days, day 4 give 600 mg bid

### Moderate to severe RLS (Horizant only)

**Adult:** PO ext rel tab 600 mg qd with food at about 5 PM; if dose is missed, take next day at 5 PM

### Hot flashes (unlabeled)

**Adult:** PO 300-400 mg at night, may titrate up q 3-7 days to max 2400 mg/day divided bid-tid × 4 wk

### Diabetic neuropathy pain (unlabeled)

**Adult:** PO 900 mg-3.6 g/day in divided doses tid

### Moderate to severe restless legs syndrome (RLS) (Horizant only)

**Adult:** PO ext rel 600 mg daily with food at about 5 PM; if dose missed, take next day at 5 PM

### Fibromyalgia (unlabeled)

**Adult:** PO 300 mg at bedtime × 1 wk, then gradually increase (target dose 2400 mg), 300 mg bid × 1 wk, 300 mg bid and 600 mg at bedtime × 2 wk, then 600 mg tid × 2 wk with 1200 mg at bedtime; to discontinue, taper by 300 mg/day

### Renal Dose

**Adult and child >12 yr PO immediate release:** CCr ≥ 60 ml/min: No change; CCr >30-59 ml/min: Total dose range 400—1400 mg/day given divided bid; CCr >15-29 ml/min: Total dose range 200-700 mg/day PO given in a single daily dose; CCr = 15 ml/min: Total dose range 100-300 mg/day given in one daily dose as 100, 125, 150, 200, or 300 mg; CCr <15 ml/min: Reduce daily dose in proportion to CCr (CCr = 7.5 ml/min should receive one-half the dose that patients with CCr of 15 ml/min receive)
**Adult: PO ext rel tablets (Gralise tablets only):** CCr ≥ 60 ml/min: No change; CCr 30-59 ml/min: 600-1800 mg/day as tolerated; CCr <30 ml/min: Do not use;
**ext rel tablets (Horizant tablets only):** CCr ≥ 60 ml/min: No change; before discontinuing reduce the dose to 600 mg q daily × 1 wk before discontinuing; CCr 30-59 ml/min: for RLS, start at 300 mg/day, increase to 600 mg/day as needed; for PHN, start at 300 mg in the AM × 3 days, then increase to 300 mg bid, increase to 600 mg bid as needed; for dose tapering before discontinuation, reduce the maintenance dose to q daily in the AM × 1 wk before discontinuing; CCr 15-29 ml/min: for RLS, 300 mg/day; for PHN, 300 mg PO on day 1 and day 3, then 300 mg qday in the AM, increase dose to 300 mg bid as needed for dose tapering, if dose is 300 mg bid, reduce dose to 300 mg qday in AM × 1 wk before discontinuation; if the dose is 300 qday, no taper is required;
CCr <15 ml/min: for RLS and PHN, 300 mg every other day, for PHN, dose can be increased to 300 mg qday in AM, no dose taper is required before discontinuing

### Fibromyalgia (unlabeled)

**Adult:** PO 300 mg at bedtime × 1 wk, then gradually increase (target dose 2400 mg), 300 mg bid and 600 mg at bedtime × 2 wk, then 600 mg tid × 2 wk with 1200 mg at bedtime, to discontinue, taper by 300 mg/day

**Available forms:** Caps 100, 300, 400 mg; tabs 600, 800 mg; oral sol 250 mg/5 ml; Horizant: ext rel tab 300, 600 mg (Gralise)

### Implementation

- Do not break, crush, or chew caps, ext rel tabs; cap may be opened and contents put in applesauce or dissolved in juice; scored tab may be cut in half
- Gradually withdraw over 7 days; abrupt withdrawal may precipitate seizures
- Give at least 2 hr apart when giving antacids; give without regard to meals (immediate release)
- Store at room temperature away from heat and light
- Provide assistance with ambulation during early part of treatment; dizziness occurs
- **Provide seizure precautions:** padded side rails, move objects that may harm patient
- **Oral sol:** measure with calibrated device, refrigerate
- **Ext release:** give with food at about 5 PM, bioavailability is increased with food; do not interchange Gralise with Horizant

## ADVERSE EFFECTS

**CNS:** *Drowsiness, confusion,* dizziness, fatigue, anxiety, somnolence, ataxia, amnesia, abnormal thinking, unsteady gait, depression; 3-12 yr old: emotional lability, aggression, thought disorder, hyperkinesia, hostility, seizures, suicidal ideation, impaired cognition, euphoria
**CV:** Vasodilatation, peripheral edema, hypotension, hypertension
**EENT:** Dry mouth, blurred vision, diplopia, nystagmus, conjunctivitis; otitis media (child 3-12 yr)
**GI:** Constipation/diarrhea, weight gain, increased appetite, dental abnormalities, nausea, vomiting; diarrhea (Gralise) G
**GU:** Impotence, bleeding, *UTI*; (Gralise)
**HEMA:** Leukopenia, thrombocytopenia, decreased WBC
**INTEG:** Pruritus, abrasion, Stevens-Johnson syndrome, acne vulgaris
**MS:** Myalgia, back pain, gout
**RESP:** Rhinitis, pharyngitis, coughing, upper respiratory infection (child 3-12 yr)
**Syst:** Drug reaction with eosinophilia and systemic symptoms (DRESS); dehydration (child 3-12 yr)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | None |
| **Excretion** | Urine unchanged |
| **Half-life** | 5-7 hr |

### Pharmacodynamics

| | Immediate Release | Extended Release |
|---|---|---|
| **Onset** | Unknown | Unknown |
| **Peak** | 2 hr | 8 hr-Gralise, 5-7 hr-Horizant |
| **Duration** | Unknown | Unknown |

G

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
Cimetidine, sevelamer, separate by 2 hr: decreased gabapentin levels
HYDROcodone, dosage reduction may be needed: Increased effect of HYDROcodone

### Drug classifications

Antacids: decreased gabapentin levels
Antihistamines, sedatives, all other CNS depressants: increased CNS depression

### Drug/lab test

False positive: urinary protein using Ames N-multistix SG

## NURSING CONSIDERATIONS

### Assessment

- **Assess seizures:** aura, location, duration, frequency, activity at onset
- Assess renal studies: urinalysis, BUN, urine creatinine q3mo
- **Assess mental status:** mood, sensorium, affect, behavioral changes, suicidal thoughts/behaviors; if mental status changes, notify prescriber
- Assess eye problems, need for ophth exam before, during, after treatment (slit lamp, fundoscopy, tonometry)
- Monitor WBC, gabapentin level (therapeutic 5.9-21 mcg/ml, toxic >85 mcg/ml), serum creatinine/BUN, weight
- Monitor for drug reaction with eosinophilia and systemic symptoms
- Provide increased fluids, bulk in diet for constipation
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk
- **Beers:** Avoid in older adults unless safer alternative is not available, ataxia, impaired psychomotor function may occur

### Patient/family education

- Advise patient to carry/wear emergency ID stating patient's name, products taken, condition, prescriber's name and phone number
- Advise patient to avoid driving, other activities that require alertness
- **Seizures:** Teach patient not to discontinue medication quickly after long-term use, withdrawal-precipitated seizures may occur, not to double dose; if dose is missed, take if 2 hr or more before next dose
- Teach patient to gradually withdraw over 7 days; abrupt withdrawal may precipitate seizures
- Teach patient to use hard candy, gum, and frequent rinsing of mouth for dry mouth
- Teach patient to increase fluids, bulk in diet for constipation
- Advise patient to notify prescriber if pregnancy is planned or suspected, avoid breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Decreased seizure activity; document on patient's chart

## TREATMENT OF OVERDOSE:

Lavage, VS

## galantamine (Rx)

(gah-lan′tah-meen)

**Razadyne, Razadyne ER, Reminyl**

*Func. class.:* Anti-Alzheimer's agent

*Chem. class.:* Cholinesterase inhibitor

**Do not confuse:** Razadyne/Rozerem

## ACTION:

Enhances cholinergic functioning by increasing acetylcholine

**Therapeutic outcome:** Decreased signs and symptoms of Alzheimer's dementia

## USES:

Mild to moderate dementia of Alzheimer's disease, vascular dementia, dementia with Lewy bodies

## CONTRAINDICATIONS

Hypersensitivity to this product, children, GI bleeding, jaundice, renal failure

**Precautions:** Pregnancy, respiratory/renal/hepatic/cardiac disease, seizure disorder, peptic ulcer, asthma, bradycardia, heart block, geriatric patients, surgery, urinary tract obstruction, breastfeeding

## DOSAGE AND ROUTES

**Adult:** PO 4 mg bid with morning and evening meals; after 4 wk or more may increase to 8 mg bid; after another 4 wk may increase to 12 mg bid; usual dose 16-24 mg/day in 2 divided doses; EXT REL 8 mg/day in AM; may increase to 16 mg/day after 4 wk, and 24 mg/day after another 4 wk

### Hepatic dose

**Adult:** (Child-Pugh 7-9) PO max 16 mg/day
**Adult:** (Child-Pugh 10-15) avoid PO use

### Renal dose

**Adult:** PO CCr 10-70 ml/min; max 16 mg/day; CCr <9 ml/min: PO avoid use

**Available forms:** Tabs 4, 8, 12 mg; ext rel caps 8, 16, 24 mg; oral sol 4 mg/ml

### Implementation

- Give with meals, morning and evening, ext rel product can be opened and sprinkled on food; do not crush/chew
- Dose increase after minimum of 4 wk at prior dose; if dose is interrupted for several days, restart at lower dose, titrate to current dose
- Provide assistance with ambulation during beginning therapy
- Perform complete suicide assessment
- Oral solution: use pipette provided; put in liquid and have patient consume

## ADVERSE EFFECTS

**CNS:** *Tremors, insomnia,* depression, dizziness, headache, somnolence, fatigue
**CV:** Bradycardia, chest pain
**GI:** *Nausea, vomiting, anorexia, abdominal distress, flatulence,* diarrhea
**GU:** Urinary incontinence, bladder outflow obstruction, hematuria
**HEMA:** Anemia
**META:** Weight decrease
**MS:** Asthenia
**RESP:** URI, rhinitis
**INTEG:** Stevens-Johnson syndrome, acute generalized exanthematous pustulosis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly and completely absorbed |
| **Distribution** | 18% protein binding |
| **Metabolism** | Liver |
| **Excretion** | Kidneys; clearance decreased in geriatric, hepatic/renal disease, females (20% lower) |
| **Half-life** | 7 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1 hr (regular release), 4.5-5 hr (extended release) |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Cholinesterase inhibitors, cholinomimetics: synergistic effect, avoid concurrent use before anesthesia

CYP3A4/CYP2D6 inducers (bosentan, carBAMazepine, fosphenytoin, nevirapine, OXcarbazepine, phenytoin, rifabutin, rifampin, rifapentine, troglitazone), anticholinergics: decreased galantamine effect, monitor for decreased effect

CYP3A4/CYP2D6 inhibitors (antiretroviral protease inhibitors, clarithromycin, conivaptan, delavirdine, diltiazem, efavirenz, erythromycin, fluconazole, fluvoxaMINE, imatinib, itraconazole, ketoconazole, nefazodone, niCARdipine, troleandomycin, verapamil, voriconazole, zafirlukast): increased galantamine effect, monitor for increased effect

NSAIDs: increased GI effects, bleeding

### Drug/herb

St. John's wort: decreased galantamine effect, avoid concurrent use

## NURSING CONSIDERATIONS

### Assessment

- **Alzheimer's disease:** Assess mental status: affect, mood, behavioral changes, depression, memory, attention, confusion, cognitive functioning
- Assess liver function enzymes: AST, ALT, alkaline phosphatase, LDH, bilirubin, CBC
- Assess for severe GI effects: nausea, vomiting, anorexia, weight loss; GU effects: urinary retention, bladder obstruction
- Assess B/P, heart rate, respiration during initial treatment, rash
- Pregnancy/breastfeeding: Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excretion unknown

### Patient/family education

- Teach patient or caregiver correct procedure for giving oral sol, using instruction sheet provided
- Instruct patient or caregiver to notify prescriber of severe GI effects
- Instruct patient or caregiver to report hypo/hypertension, slow heart rate
- Teach patient to take with food to minimize side effects
- Teach patient to notify prescriber immediately and stop taking product if rash occurs.

### Evaluation

#### Positive therapeutic outcome

- Decreased symptoms of dementia
- Increased coherence
- Improved cognitive performance (memory, orientation, attention, reasoning, language, praxis)

## TREATMENT OF OVERDOSE:

Administer **IV** atropine titrated to effect at an initial dose of 0.5-1 mg, with subsequent doses based on clinical response; provide general supportive measures

## ganciclovir (Rx)

(gan-sye'kloe-vir)

**Cytovene, Vitrasert, Zirgan**

*Func. class.:* Antiviral

*Chem. class.:* Synthetic nucleoside analog

G

**Do not confuse:** Cytovene/Cytosar

**ACTION:** Inhibits replication of herpes viruses in vitro; competitively inhibits human cytomegalovirus (CMV) DNA polymerase and is incorporated, resulting in termination of DNA elongation

**Therapeutic outcome:** Decreased proliferation of virus responsible for CMV retinitis

**USES:** Cytomegalovirus (CMV) retinitis in immunocompromised persons, including those with AIDS, after indirect ophthalmoscopy confirms diagnosis; prophylaxis of CMV in transplantation

## CONTRAINDICATIONS

Hypersensitivity to acyclovir, famciclovir, penciclovir, valacyclovir, valganciclovir, or ganciclovir

**BLACK BOX WARNING:** ANC $<500/mm^3$, platelet count $<25,000/mm^3$ (intravitreal)

**Precautions:** Pregnancy, breastfeeding, children <6 mo, geriatric, preexisting cytopenias, renal function impairment, radiation therapy

**BLACK BOX WARNING:** Secondary malignancy, bone marrow suppression, anemia, infertility, neutropenia, pregnancy, male-mediated teratogenicity

## DOSAGE AND ROUTES

### Induction treatment

**Adult: IV** 5 mg/kg/dose given over 1 hr q12hr × 2-3 wk

### Maintenance treatment

**Adult: IV** INF 5 mg/kg/day given over 1 hr, daily × 7 days/wk; or 6 mg/kg/day × 5 days/wk; PO 1000 mg tid with food or 500 mg q3hr while awake; Intravitreal 4.5-mg implant

### Prevention of CMV infection

**Adult: IV** 5 mg/kg/dose over 1 hr q12hr × 1-2 wk, then 5 mg/kg/day × 7 days/wk, then 6 mg/

kg/day × 5 days/wk; PO 1000 mg tid, starting 10 days posttransplant × 14 days

### Renal dose

**Adult:** IV CCr 50-69 ml/min, reduce to 2.5 mg/kg q12hr (induction), 2.5 mg/kg q24hr (maintenance); PO 1500 mg/day or 500 mg tid; IV CCr 25-49 ml/min reduce to 2.5 mg q24hr (induction); 1.25 mg/kg q24hr (maintenance); PO 1000 mg/day or 500 mg bid; IV CCr 10-24 ml/min reduce to 1.25 mg/kg q24hr (induction); 0.625 mg/kg q24hr (maintenance); PO 500 mg/day; IV CCr <10 ml/min reduce to 1.25 mg/kg 3×/wk after hemodialysis (induction); 0.625 mg/kg 3×/wk after hemodialysis (maintenance); PO 500 mg 3×/wk after hemodialysis

**Available forms:** Powder for inj 500 mg/vial, caps 250, 500 mg; implant, intravitreal 4.5 mg

### Implementation

**PO route**

- Give with food, do not open or crush caps

**IV route**

- Product should be mixed under strict aseptic conditions using gloves, gown, and mask and using precautions for antineoplastics, do not use if particulate matter is present

**Intermittent IV inf route**

- Administer **IV** after reconstituting 500 mg/10 ml of sterile water for inj (50 mg/ml); shake; further dilute in 100 ml of $D_5W$, 0.9% NaCl, LR, Ringer's and run over 1 hr; use inf pump, in-line filter, flush line well before and after product
- Do not give by BOL **IV**, IM, SUBCUT inj
- Use reconstituted sol within 12 hr, do not refrigerate or freeze; do not use sol with particulate matter or discoloration, fludarabine, sargramostim

**Y-site compatibilities:** Allopurinol, CISplatin, cyclophosphamide, enalaprilat, etoposide, filgrastim, fluconazole, gatifloxacin, granisetron, linezolid, melphalan, methotrexate, PACLitaxel, propofol, tacrolimus, teniposide, thiotepa

**Y-site incompatibilities:** Amsacrine, fludarabine, foscarnet, ondansetron, sargramostim, vinorelbine

**Intravitreal implant route**

- Implanted by surgeon only
- Handle carefully to prevent damage to coating

## ADVERSE EFFECTS

**CNS:** *Fever,* chills, coma, *confusion,* abnormal thoughts, dizziness, bizarre dreams, *headache,* psychosis, tremors, somnolence, *paresthesia, weakness,* seizures, peripheral neuropathy

**CV:** Dysrhythmia, hypo/hypertension

**EENT:** Retinal detachment in CMV retinitis, cataracts, ocular hypertension, ocular pain, conjunctival scarring

**GI:** *Abnormal liver function tests, nausea, vomiting, anorexia, diarrhea, abdominal pain,* hemorrhage, perforation, pancreatitis

**GU:** Hematuria, *increased creatinine,* BUN

**HEMA:** Granulocytopenia, thrombocytopenia, irreversible neutropenia, anemia, eosinophilia, pancytopenia

**INTEG:** *Rash,* alopecia, *pruritus,* urticaria, pain at inj site, phlebitis

**RESP:** Dyspnea, pneumonia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Completely absorbed, increased bioavailability with fatty foods |
| **Distribution** | Crosses blood-brain barrier, CSF |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys (90%) unchanged, breast milk |
| **Half-life** | 3 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Adriamycin, amphotericin B, cycloSPORINE, dapsone, DOXOrubicin, flucytosine, mycophenolate, pentamidine, probenecid, tacrolimus, trimethoprim/sulfa combinations, vinBLAStine, vinCRIStine: increased ganciclovir toxicity

Didanosine: increased didanosine effect

Imipenem with cilastatin: increased risk for seizures

Probenecid: decreased renal clearance of ganciclovir

Radiation, zidovudine: severe granulocytopenia; do not give together

Tenofovir: increased effect

### Drug classifications

Antineoplastics: severe granulocytopenia; do not give together

Nucleoside analogs, NSAIDs: increased toxicity

## NURSING CONSIDERATIONS

### Assessment

- **CMV retinitis:** Cultures of blood, urine, and throat may all be taken; CMV is not confirmed by this method; the diagnosis is made by an ophthalmic exam
- Assess kidney, liver function; increases in hemopoietic studies: BUN, serum creatinine, AST

creatinine clearance, ALT, A:G ratio, baseline, and drip treatment; blood counts should be done q2wk; watch for decreasing granulocytes, Hgb; if low, therapy may have to be discontinued and restarted after hematologic recovery; blood transfusions may be required
• Assess for GI symptoms: severe nausea, vomiting, diarrhea; severe symptoms may necessitate discontinuing product
• Monitor electrolytes and minerals: calcium, phosphorus, magnesium, sodium, potassium; watch closely for tetany during 1st administration
• Assess for symptoms of allergic reactions: flushing, rash, urticaria, pruritus

**BLACK BOX WARNING: Monitor for leukopenia/neutropenia/thrombocytopenia:** WBCs, platelets q2day during 2 ×/day dosing and qwk thereafter; check for leukopenia with daily WBC count in patients with prior leukopenia with other nucleoside analogs or for whom leukopenia counts are <1000 cells/mm$^3$ at start of treatment; bruising, fatigue, bleeding, poor healing

• Assess for seizures, dysrhythmias

**BLACK BOX WARNING:** Assess for secondary malignancy; avoid direct contact with powder in caps/solution; if skin contact occurs, wash thoroughly with soap and water; do not get in the eyes

### Patient/family education
• Advise patient to notify prescriber if sore throat, swollen lymph nodes, malaise, fever occur; may indicate other infections
• Advise patient to report perioral tingling, numbness in extremities, and paresthesias
• Caution patient that serious product interactions may occur if OTC products are ingested; check first with prescriber
• Inform patient that product is not a cure, but will control symptoms
• Advise patient that regular blood tests, ophth exams must be continued
• Inform patient that major toxicities may necessitate discontinuing product

**BLACK BOX WARNING: Pregnancy:** Instruct patient to use contraception during treatment of males, females and that infertility may occur; men should use barrier contraception for 90 days after treatment; not to breastfeed (IV)

• Teach patient to take PO with food, do not open or crush caps
• Teach patient to report infection: fever, chills, sore throat; blood dyscrasias: bruising, bleeding, petechiae
• Tell patient to avoid crowds, persons with respiratory infection
• Advise patient to use sunscreen to prevent burns
• Advise patient to report itching, redness, or eye pain (ophthalmic treatment)

### Evaluation
**Positive therapeutic outcome**
• Decreased symptoms of CMV infection

G

## ganciclovir ophthalmic
*See Appendix B*

## gatifloxacin ophthalmic
*See Appendix B*

**⚠ HIGH ALERT**

## gemcitabine (Rx)
(gem-sit'a-been)
**Gemzar**
*Func. class.:* Antineoplastic—miscellaneous
*Chem. class.:* Pyrimidine analog

**Do not confuse:** Gemzar/Zinecard

**ACTION:** Exhibits antitumor activity by killing cells undergoing DNA synthesis (S phase) and blocking $G_1$/S-phase boundary

**Therapeutic outcome:** Prevention of growth of tumor

**USES:** Adenocarcinoma of the pancreas (nonresectable stage II, III, or metastatic stage IV); in combination with CISplatin for inoperable, advanced, or metastatic non–small cell lung cancer; advanced breast cancer in combination with PACLitaxel; with CARBOplatin for ovarian cancer, biliary tract cancer

### CONTRAINDICATIONS
Pregnancy, breastfeeding, hypersensitivity

**Precautions:** Children, geriatric, myelosuppression, radiation therapy, renal/hepatic disease

### DOSAGE AND ROUTES
**Pancreatic carcinoma (nonresectable stage II, III, IV)**
**Adult: IV** 1000 mg/m$^2$ given over ½ hr qwk × 7 wk, then 1 wk rest period; subsequent cycles should be infused once qwk × 3 wk out of every 4 wk depending on hematologic toxicity

### Non–small cell lung cancer, inoperable locally advanced stage IIIA or IIIB or metastatic stage IV

#### 4 wk schedule

**Adult: IV** 1000 mg/m$^2$ given over ½ hr on days 1, 8, 15 of each 28-day cycle; give CISplatin **IV** 100 mg/m$^2$ on day 1 after gemcitabine

#### 3 wk schedule

**Adult:** IV 1250 mg/m$^2$ given over ½ hr on days 1, 8 of each 21-day cycle; give CISplatin 100 mg/m$^2$ after the INF of gemcitabine on day 1

### Advanced breast cancer

**Adult: IV** 1250 mg/m$^2$ over ½ hr on days 1 and 8 of a 21-day cycle; give with PACLitaxel on day 1, 175 mg/m$^2$ over 3 hr prior to gemcitabine

**Available forms:** Lyophilized powder for inj 200 mg, 1 gm, 2 gm; solution for inj 1 gm/26.3 ml, 200 mg/ 5.26 ml, 2 gm/52.6 ml

### Implementation

- Give increased fluid intake to 2-3 L/day to prevent dehydration, unless contraindicated
- Provide antiemetic agents before and after treatment

**IV route**

- Prepare in biological cabinet using gown, mask, gloves, infusion related reactions including hypotension, severe flulike symptoms, myelosuppression, asthenia
- After reconstituting with 0.9% NaCl 5 ml/200 mg vial of product or 25 ml/1 g of product, shake (38 mg/ml); may be further diluted with 0.9% NaCl to concentrate as low as 0.1 mg/ml; discard unused portion, give over ½ hr, do not admix

**Y-site compatibilities:** Alemtuzumab, alfentanil, allopurinol, amifostine, amikacin, aminophylline, ampicillin, anidulafungin, argatroban, aztreonam, bivalirudin, bleomycin, bumetanide, butorphanol, calcium gluconate, caspofungin, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, chlorproMAZINE, cimetidine, ciprofloxacin, CISplatin, clindamycin, cyclophosphamide, cytarabine, DACTINomycin, DAUNOrubicin, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, DOXOrubicin, droperidol, enalaprilat, etoposide, famotidine, floxuridine, fluconazole, fludarabine, fluorouracil, gentamicin, granisetron, haloperidol, heparin, hydrocortisone, HYDROmorphone, IDArubicin, ifosfamide, leucovorin, linezolid, LORazepam, mannitol, meperidine, mesna, metoclopramide, metroNIDAZOLE, minocycline, mitoXANtrone, morphine, nalbuphine, ondansetron, PACLitaxel, promethazine, ranitidine, streptozocin, teniposide, thiotepa, ticarcillin, tigecycline tobramycin, topotecan, trimethoprim/sulfamethoxazole, vancomycin, vinBLAStine, vinCRIStine, vinorelbine, voriconazole zidovudine, zoledronic acid

**Y-site incompatibilities:** Acyclovir, amphotericin B colloidal, amphotericin B lipid complex, amphotericin B liposome, cefepime, cefoperazone, cefotaxime, chloramphenicol, dantrolene, DAPTOmycin, diazepam, furosemide, ganciclovir, imipenem-cilastatin, irinotecan, ketorolac, lansoprazole, methotrexate, methylPREDNISolone, mitoMYcin, nafcillin, pantoprazole, PEMEtrexed, phenytoin, piperacillin, prochlorperazine, thiopental

## ADVERSE EFFECTS

**GI:** Diarrhea, nausea, vomiting, anorexia, constipation, stomatitis, diarrhea, hepatotoxicity
**GU:** Proteinuria, hematuria
**HEMA:** Leukopenia, anemia, neutropenia, thrombocytopenia
**INTEG:** Irritation at site, rash, alopecia
**MISC:** Dyspnea, fever, hemorrhage, infection, flulike syndrome, paresthesia, peripheral edema, myalgia, capillary leak syndrome
RESP: Dyspnea, bronchospasm, pneumonitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Crosses placenta |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 2.5-18 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drug

Alcohol: increased bleeding

### Drug classifications

Anticoagulants, NSAIDs, salicylates: increased bleeding
Antineoplastics, radiation: increased myelosuppression, diarrhea
Bleomycin: Increase: Pulmonary toxicity
cloZAPine: Avoid concurrent use
DOXOrubicin: Increase: Hemolytic-uremic disorder
Live virus vaccines: decreased antibody response

### Drug/lab test

Increased: BUN, AST, ALT, alkaline phosphatase, bilirubin, creatinine

## NURSING CONSIDERATIONS

### Assessment

- **Bone marrow depression:** monitor CBC, differential, platelet count before each

dose; single agent: absolute granulocyte count >1000, and platelets >100,000, give complete dose; absolute granulocyte count 500-999/mm$^3$, platelets 50,000-99,999/mm$^3$, give 75%; absolute granulocyte count <500 or platelets <50,000/mm$^3$, do not give; combination with PACLitaxel in breast cancer: absolute granulocyte count >1200/mm$^3$ and platelets >75,000/mm$^3$, give complete dose; absolute granulocyte count 1000-1199/mm$^3$ or platelets 50,000-75,000/mm$^3$, give 75%; absolute granulocyte 700-999/mm$^3$ or platelets ≥50,000/mm$^3$, give 50%; granulocyte count <700/mm$^3$ or platelets <50,000/mm$^3$, do not give; combination with CARBOplatin in ovarian cancer: absolute granulocyte count >1500/mm$^3$ and platelet count >100,000/mm$^3$, give complete dose; absolute granulocyte count 1000-1499/mm$^3$ or platelets 75,000-99,999/mm$^3$, give 75%; absolute granulocyte count <1000/mm$^3$ or platelets <75,000/mm$^3$, do not give

- **Assess for blood dyscrasias:** bruising, bleeding, petechiae
- Monitor I&O, nutritional intake
- Monitor renal/hepatic studies before, during treatment; may increase AST, ALT, alkaline phosphatase, bilirubin, BUN, creatinine
- Assess food preferences: list likes, dislikes
- Assess buccal cavity for dryness, sores or ulceration, white patches, oral pain, bleeding, dysphagia
- Assess GI symptoms: frequency of stools; cramping
- Capillary leak syndrome: Monitor for hemoconcentration, decreased albumin, B/P; discontinue
- Assess signs of dehydration: rapid respirations, poor skin turgor, decreased urine output, dry skin, restlessness, weakness
- Hemolytic uremic syndrome (HUS) may occur more frequently when given with bleomycin, assess renal function before use and periodically, anemia with microangiopathic hemolysis, elevated bilirubin or LDH, reticulocytosis, severe thrombocytopenia, increased BUN/creatinine are indications of HUS; permanently discontinue this product; pneumonitis, pulmonary edema, acute respiratory distress syndrome (ARDs)
- Pulmonary fibrosis or evidence of pulmonary toxicity, may occur ≤ 2 wk after last dose

### Patient/family education

- Teach patient to rinse mouth tid-qid with water, club soda; brush teeth bid-tid with soft brush or cotton-tipped applicator for stomatitis; use unwaxed dental floss
- Advise patient to avoid foods with citric acid or hot or rough texture if stomatitis is present; to drink adequate fluids
- Advise patient to report stomatitis; any bleeding, white spots, ulcerations in mouth; tell patient to examine mouth daily, report symptoms
- Advise patient to report signs of anemia: fatigue, headache, faintness, shortness of breath, irritability; hematuria, dysuria
- **Pregnancy/breastfeeding:** Advise patient to use contraception during therapy and for 4 mo after
- Instruct patient to avoid use with NSAIDs, salicylates, alcohol; not to receive vaccinations during treatment
- Teach about possible hair loss and what can be done
- Advise to report flulike symptoms, swelling of feet/legs, bruising; bleeding of gums, blood in urine, stools, emesis
- Teach to avoid crowds, persons with known upper respiratory infections
- Advise patient to use electric razor

### Evaluation

**Positive therapeutic outcome**

- Decrease in tumor size, decrease in spread of cancer, symptom relief

**TREATMENT OF OVERDOSE:** Induce vomiting, provide supportive care

## gemfibrozil (Rx)

(gem-fye'broe-zil)
**Lopid**
*Func. class.:* Antilipemic
*Chem. class.:* Fibric acid derivative

**Do not confuse:** Lopid/Levbid/Slo-bid

**ACTION:** Inhibits biosynthesis of VLDL, decreases triglycerides production in the liver, increases HDLs

**Therapeutic outcome:** Decreased hepatic triglyceride production, VLDL; accelerates removal of cholesterol from liver

**USES:** For use as an adjunct to diet for the treatment of hyperlipoproteinemia and for hypertriglyceridemia, including type IV (elevated triglycerides, VLDL) and type V (elevated triglycerides, chylomicrons, VLDL) in patients who have significant risk of coronary artery disease or pancreatitis and have not responded to diet

## CONTRAINDICATIONS
Severe renal/hepatic disease, preexisting gallbladder disease, primary biliary cirrhosis, hypersensitivity

**Precautions:** Pregnancy, breastfeeding, renal disease, cholelithiasis, children

## DOSAGE AND ROUTES
**Adult:** PO 600 mg bid 30 min before meals

### Hepatic/renal dose
Avoid use

**Available forms:** Tabs 600 mg; caps 300 mg

### Implementation
- Give 30 min before AM and PM meals

## ADVERSE EFFECTS
**CNS:** Fatigue, vertigo, headache, paresthesia, dizziness, somnolence
**GI:** Nausea, vomiting, *dyspepsia, diarrhea, abdominal pain*
**HEMA:** Leukopenia, anemia, eosinophilia, thrombocytopenia
**INTEG:** Rash, urticaria, pruritus
**MISC:** Task perversion
**MS:** Myopathy, rhabdomyolysis
**SYST:** Angioedema, exfoliative dermatitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Unknown, plasma protein binding >95% |
| **Metabolism** | Liver, minimal |
| **Excretion** | Kidney, unchanged (70%), feces (6%) |
| **Half-life** | 1½ hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 1-2 hr |
| **Peak** | 1-2 hr |
| **Duration** | 2-4 months |

## INTERACTIONS
### Individual drugs
Do not use with repaglinide, simvastatin
Repaglinide, metformin, glyburide, pioglitazone, other antidiabetic agents: increased hypoglycemic effect
Warfarin, avoid concurrent use: increased anticoagulant effect

### Drug classifications
Bile acid sequestrants: decreased effect of gemfibrozil, separate by >2 hr
HMG-CoA reductase inhibitors: increased risk of myositis, myalgia, rhabdomyolysis
Sulfonylureas: increased hypoglycemic effect
Cyclosporine: Increase: nephrotoxicity, monitor renal function
CYP2C*, CYP2C9, CYP2C19: Increased levels, monitor for toxicities

### Drug/lab test
Increased: liver function tests, CK, bilirubin, alkaline phosphatase
Decreased: Hgb, Hct, WBC, potassium

## NURSING CONSIDERATIONS
### Assessment
- **Hypercholesteremia:** Assess nutrition: fat, protein, carbohydrates; nutritional analysis should be performed by dietitian before treatment is initiated; monitor triglycerides, cholesterol, lipids baseline, during treatment; LDL and VLDL should be watched closely and if increased, product should be discontinued
- Assess renal, liver function tests, CBC, blood glucose if patient is on long-term therapy; if liver function test results increase, product should be discontinued; monitor hematologic and hepatic function
- Monitor bowel pattern daily; diarrhea may be a problem
- **Myopathy, rhabdomyolysis:** Assess for muscle pain, tenderness; obtain baseline CPK: if elevated or if these occur, product should be discontinued
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed, excretion unknown

### Patient/family education
- Inform patient that compliance is needed for positive results to occur; not to double doses, take missed dose as soon as remembered unless almost time for next dose; that product may be discontinued if no improvement in 3 mo
- Caution patient to decrease risk factors: high-fat diet, smoking, alcohol consumption, lack of exercise
- Advise patient to notify prescriber if GI symptoms of diarrhea, abdominal or epigastric pain, nausea, vomiting occur; or if chills, fever, sore throat occur; also occurrence of muscle cramps, abdominal cramps, severe flatulence

### Evaluation
#### Positive therapeutic outcome
- Decreased cholesterol levels, serum triglyceride and improved ratio with HDLs

## gemifloxacin (Rx)

(gem-ah-flox′a-sin)

**Factive**

*Func. class.:* Antiinfective

*Chem. class.:* Fluoroquinolone

**ACTION:** Inhibits DNA gyrase, which is an enzyme involved in replication, transcription, and repair of bacterial DNA

**Therapeutic outcome:** Negative C&S, decreasing symptoms of infection

**USES:** Acute bacterial exacerbation of chronic bronchitis caused by *Streptococcus pneumoniae, Haemophilus influenzae, Haemophilus parainfluenzae, Moraxella catarrhalis;* community-acquired pneumonia caused by *Streptococcus pneumoniae* including multiproduct-resistant strains, *H. influenzae, M. catarrhalis, Mycoplasma pneumoniae, Chlamydia pneumoniae, Klebsiella pneumoniae*

## CONTRAINDICATIONS

Hypersensitivity to quinolones

**Precautions:** Pregnancy, breastfeeding, children, geriatric, hypokalemia, hypomagnesemia, renal disease, seizure disorders, excessive exposure to sunlight, psychosis, increased intracranial pressure, history of QT interval prolongation, dysrhythmias, myasthenia gravis, torsades de pointes

**BLACK BOX WARNING:** Tendon pain/rupture, tendinitis, neurotoxicity

## DOSAGE AND ROUTES

**Adult:** PO 320 mg/day × 3-5 days depending on type of infection

### Renal dose

**Adult:** PO CCr ≤40 ml/min 160 mg q24hr

**Available forms:** Tabs 320 mg

### Implementation

- Give with or without food
- Theophylline should not be used with this product; toxicity may result
- Administer 2 hr before or 3 hr after antacids, iron, zinc, or buffered products
- Provide adequate hydration

## ADVERSE EFFECTS

**CNS:** *Dizziness, headache,* somnolence, depression, insomnia, nervousness, confusion, agitation, seizures, pseudotumor cerebri

**CV:** QT prolongation, vasodilatation

**EENT:** Visual disturbances, retinal detachment

**GI:** Diarrhea, *nausea,* vomiting, anorexia, flatulence, heartburn, dry mouth; increased AST, ALT; constipation, abdominal pain, pseudomembranous colitis

**GU:** Crystalluria (rare), vaginitis, interstitial nephritis

**INTEG:** Rash, pruritus, urticaria, *photosensitivity*

**SYST:** Anaphylaxis, Stevens-Johnson syndrome, toxic epidermal necrolysis, exfoliative dermatitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly, bioavailability 71% |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | In urine as active product, metabolites |
| **Half-life** | 4-12 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | $^1/_2$ hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Amoxapine, chloroquine, cloZAPine, dasatinib, dolasetron, dronedarone, droperidol, erythromycin, flecainide, haloperidol, lapatinib, maprotiline, methadone, octreotide, ondansetron, palonosetron, pentamidine, pimozide, propafenone, ranolazine, risperidone, sertindole, SUNItinib, tacrolimus, telithromycin, troleandomycin, vardenafil, vorinostat, ziprasidone: increased QT prolongation

Probenecid: may increase toxicity

**BLACK BOX WARNING:** Corticosteroids: Increase: Tendon rupture

Theophylline: toxicity; do not use concurrently

### Drug classifications

Antacids containing aluminum, iron, magnesium, sucralfate, zinc: decreased absorption; give 2 hr before or 3 hr after meals

Antiarrhythmics (amiodarone, disopyramide, procainamide, quiNIDine, sotalol), antidepressants (tricyclics), b-blockers, halogenated/local anesthetics: may decrease effect, resulting in life-threatening dysrhythmias, QT prolongation

Drugs that increase QT prolongation: increased QT prolongation

NSAIDs: increased CNS stimulation

## NURSING CONSIDERATIONS

### Assessment

- Monitor renal, liver function tests: BUN, creatinine, AST, ALT, electrolytes
- Monitor I&O ratio; urine pH, <5.5 is ideal
- Assess CNS symptoms: insomnia, vertigo, headache, agitation, confusion

**BLACK BOX WARNING: Tendon rupture**
Assess for tendon pain, inflammation; if present discontinue use; more common with corticosteroids; discontinue immediately if tendon pain, inflammation occurs

- **Assess allergic reactions and anaphylaxis:** rash, flushing, urticaria, pruritus, chills, fever, joint pain; may occur a few days after therapy begins; EPINEPHrine and resuscitation equipment should be available for anaphylactic reaction
- **Pseudomembranous colitis:** Monitor bowel pattern daily; if severe diarrhea, fever, abdominal pain occurs, product should be discontinued
- **Assess for overgrowth of infection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum
- **QT prolongation:** Avoid use of quinolones in those with known QT prolongation; females and those with ongoing proarrhythmic conditions (TdP) are at greater risk; monitor ECG and/or Holter monitoring if product is used
- **Toxic psychosis/pseudotumor cerebri:** Assess for headache, blurred vision, neck/shoulder pain, nausea/vomiting, dizziness, tinnitus; discontinue immediately, may occur within hours to weeks after starting product
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk

### Patient/family education

- Advise patient that fluids must be increased to 2 L/day to avoid crystallization in kidneys
- Instruct patient that if dizziness or light-headedness occurs, to ambulate, perform activities with assistance
- Instruct patient to complete full course of product therapy
- Teach patient to contact prescriber if adverse reactions occur
- Teach patient to avoid iron- or mineral-containing supplements or aluminum/magnesium antacids within 2 hr before or 3 hr after dosing
- Advise patient that photosensitivity may occur and sunscreen should be used
- Advise patient to use frequent rinsing of mouth, sugarless candy or gum for dry mouth
- Teach patient to avoid other medication unless approved by prescriber
- **Tendon pain:** To immediately report pain, inflammation in tendons, weakness, tingling in extremities
- **Allergic reactions:** To report rash and stop product if it occurs

### Evaluation

**Positive therapeutic outcome**

- Negative C&S, absence of signs/symptoms of infection

## gentamicin (Rx)

(jen-ta-mye'sin)
**Cidomycin**
*Func. class.:* Antiinfective
*Chem. class.:* Aminoglycoside

**Do not confuse:** gentamicin/kanamycin/clindamycin/ tobramycin/erythromycin/vancomycin

**ACTION:** Interferes with protein synthesis in bacterial cell by binding to 30S ribosomal subunit, causing misreading of genetic code; inaccurate peptide sequence forms in protein chain, causing bacterial death

**Therapeutic outcome:** Bactericidal effects for the following organisms: *Pseudomonas aeruginosa, Proteus, Klebsiella, Serratia, Escherichia coli, Enterobacter, Citrobacter, Staphylococcus, Shigella, Salmonella, Acinetobacter, Bacillus anthracis*

**USES:** Severe systemic infections of CNS; respiratory, GI, and urinary tracts; bone; skin; soft tissues; caused by susceptible strains

## CONTRAINDICATIONS

Hypersensitivity to this or other aminoglycosides

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Breastfeeding, geriatric, neonates, pseudomembranous colitis

**BLACK BOX WARNING:** Myasthenia gravis, Parkinson's disease, infant botulism, tinnitus, nephrotoxicity, neurotoxicity, ototoxicity

## DOSAGE AND ROUTES

### Severe systemic infections

**Adult: IV** INF 3-6 mg/kg/day in 3 divided doses q8hr; IM 3-5 mg/kg/day in divided doses q8hr
**Child: IV/IM** 2-2.5 mg/kg q8hr

**Neonate and infant:** IV/IM 2.5 mg/kg q8-12hr

**Neonate <1 wk:** 2.5 mg/kg q12hr

### Renal dose

**Adult:** IM/IV CCr 70-100 ml/min reduce dose by multiplying maintenance dose by 0.85, give q8-12hr; CCr 50-69 ml/min reduce dose as above, give q12hr; CCr 25-49 ml/min reduce as above, give q24hr; CCr <25 ml/min reduce as above, give based on serum concentrations

### Renal dose: extend interval (unlabeled)

**Adult:** IV CCr 40-59 ml/min, 5-7 mg/kg q36hr; CCr 20-39 ml/min, 5-7 mg/kg q48hr; CCr <20 ml/min, 5-7 mg/kg once, then base on serial levels

**Available forms:** Inj 10, 40 mg/ml; premixed inj 40, 60, 70, 80, 90, 100, 120 mg/100 ml NS

### Implementation

**IM route**

- Give inj deeply in large muscle mass; rotate sites

**IV route**

- Give in even doses around the clock; product must be given for 10-14 days to ensure organism death and prevent superinfection
- After diluting in 50-200 ml normal saline, $D_5W$, decrease volume of diluent in child; maintain 0.1% solution, run over $^1/_2$-1 hr (adults), up to 2 hr (child). Give by intermittent inf, flush with 0.9% NaCl or $D_5W$ after inf
- Separate aminoglycosides and penicillins by ≥1 hr
- Store in tight container

**IV compatibility of gentamicin sulfate with:** Alatrofloxacin, aldesleukin, alemtuzumab, alfentanil, alprostadil, amifostine, amikacin, aminocaproic acid, aminophylline, amiodarone, amsacrine, anidulafungin, argatroban, arsenic trioxide, ascorbic acid injection, asparaginase, atenolol, atracurium, atropine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, carmustine, caspofungin, cefamandole, ceFAZolin, cefepime, cefotaxime, cefOXitin, cefpirome, ceftaroline, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chlorothiazide, chlorpheniramine, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clarithromycin, clindamycin, cloxacillin, codeine, colistimethate, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, DAUNOrubicin citrate liposome, DAUNOrubicin hydrochloride, dexmedetomidine, dexrazoxane, digoxin, diltiazem, dimenhyDRINATE, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doripenem, doxacurium, doxapram, DOXOrubicin hydrochloride, DOXOrubicin hydrochloride liposomal, doxycycline, edetate calcium disodium, edetate disodium, enalaprilat, EPHEDrine, EPINEPHrine, epirubicin, epoetin alfa, eptifibatide, ergonovine, ertapenem, erythromycin lactobionate, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fenta-NYL, fluconazole, fludarabine, fluorouracil, foscarnet, gallamine, gallium, gatifloxacin, gemcitabine, glycopyrrolate, granisetron, HYDROmorphone, hydrOXYzine, ifosfamide, imipenemcilastatin, irinotecan, isoproterenol, ketamine, ketorolac, labetalol, lactated Ringer's injection, lansoprazole, lepirudin, leucovorin, levofloxacin, lidocaine, lincomycin, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, mephentermine sulfate, meropenem, mesna, metaraminol, methyldopate, methylprednisolone sodium succinate, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, minocycline, mitoXANtrone, mivacurium, morphine, multiple vitamins injection, mycophenolate mofetil, nafcillin, nalbuphine, nalorphine, naloxone, netilmicin, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oritavancin, oxacillin, oxaliplatin, oxytocin, PACLitaxel (solvent/surfactant), palonosetron, pamidronate, pancuronium, papaverine, penicillin G potassium/sodium, pentazocine, perphenazine, PHENobarbital, phentolamine, phenylephrine, phytonadione, piperacillin, polymyxin B, posaconazole, potassium acetate/chloride, procainamide, prochlorperazine, promazine, promethazine, propranolol, protamine, pyridoxine, quiNIDine gluconate, ranitidine, remifentanil, Ringer's injection, riTUXimab, rocuronium, sargramostim, sodium acetate/bicarbonate/citrate, streptomycin, succinylcholine, SUFentanil, tacrolimus, telavancin, temocillin, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA (3-in-1), tobramycin, tolazoline, topotecan, TPN (2-in-1), trastuzumab, trimetaphan, tubocurarine, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, vitamin B complex with C, voriconazole, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CNS:** Confusion, depression, numbness, tremors, seizures, muscle twitching, neurotoxicity, dizziness, vertigo, encephalopathy, fever, headache, lethargy
**CV:** Hypotension, hypertension, palpitations, edema
**EENT:** Ototoxicity, deafness, visual disturbances, tinnitus
**GI:** *Nausea, vomiting, anorexia,* increased ALT, AST, bilirubin, hepatomegaly, hepatic necrosis, splenomegaly
**GU:** Oliguria, hematuria, renal damage, azotemia, renal failure, nephrotoxicity, proteinuria
**HEMA:** Agranulocytosis, thrombocytopenia, leukopenia, eosinophilia, anemia
**INTEG:** *Rash,* burning, urticaria, dermatitis, alopecia, photosensitivity, anaphylaxis
**MS:** Twitching, myasthenia gravis–like symptoms
**RESP:** Apnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (IM) |
| **Distribution** | Distributed in extracellular fluids, poorly distributed in CSF; crosses placenta |
| **Metabolism** | Liver, minimal |
| **Excretion** | Mostly unchanged (79%) kidneys |
| **Half-life** | 1-2 hr; infants 6-7 hr; increased in renal disease |

### Pharmacodynamics

| | IM | IV |
|---|---|---|
| **Onset** | Rapid | Rapid |
| **Peak** | 30-90 min | Infusion's end |
| **Duration** | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

**BLACK BOX WARNING:** Acyclovir, amphotericin B, cidofovir, CISplatin, cycloSPORINE, ethacrynic acid, foscarnet, furosemide, ganciclovir, mannitol, methoxyflurane, pamidronate, polymyxin, tacrolimus, vancomycin, zoledronic acid: increased ototoxicity, neurotoxicity, nephrotoxicity

### Drug classifications

**BLACK BOX WARNING:** Aminoglycosides, cephalosporins, penicillins: increased otoxicity, neurotoxicity, nephrotoxicity

Nondepolarizing neuromuscular blockers: increased neuromuscular blockade, respiratory depression
Penicillins: Do not use at the same time as or physically mix with penicillins

### Drug/lab test

Increase: LDH, AST, ALT, bilirubin, BUN, creatinine, eosinophils
Decrease: Hgb, WBC, platelets, granulocytes

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for previous sensitivity reaction
- **Assess patient for signs and symptoms of infection** including characteristics of wounds, sputum, urine, stool, WBC >10,000/mm$^3$, fever; obtain baseline during treatment

**BLACK BOX WARNING: Neurotoxicity (myasthenia gravis, Parkinson's disease, infant botulism):** Assess for paresthesias, tetany, Chvostek's/Trousseau's signs, confusion (adults) tetany, muscle weakness (infants); correct electrolyte imbalance

- Complete C&S before beginning product therapy; this will ensure that correct treatment has been initiated
- **Assess for allergic reactions:** rash, urticaria, pruritus, chills, fever, joint pain may occur a few days after therapy begins

**BLACK BOX WARNING: Nephrotoxicity** Identify urine output; if decreasing, notify prescriber (may indicate nephrotoxicity); also, increased BUN, creatinine, urine CCr <80 ml/min; monitor I&O ratio; urinalysis daily for proteinuria, cells, casts; report sudden change in urine output; assess urine pH if product is used for UTI; urine should be kept alkaline

- Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test monthly if patient is on long-term therapy
- Monitor electrolytes: potassium, sodium, chloride, magnesium monthly if patient is on long-term therapy
- Monitor for bleeding: ecchymosis, bleeding gums, hematuria; assess stool guaiac daily if on long-term therapy
- **Assess for overgrowth of infection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum
- Obtain weight before treatment; calculation of dosage is usually based on ideal body weight but may be calculated on actual body weight

• Monitor VS during inf, watch for hypotension, change in pulse
• Assess **IV** site for thrombophlebitis including pain, redness, swelling q30min, change site if needed; apply warm compresses to discontinued site
• Obtain serum peak, measured at 30-60 min after **IV** inf or 60 min after IM inj, trough level measured just before next dose; blood level should be 2-4 times bacteriostatic level (based on traditional dosing)

**BLACK BOX WARNING: Ototoxicity: Assess for deafness** by audiometric testing, ringing, roaring in ears, vertigo; assess hearing before, during, after treatment

• Assess for dehydration: high specific gravity, decrease in skin turgor, dry mucous membranes, dark urine
• **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, use only if benefits outweigh fetal risk, avoid breastfeeding

### Patient/family education

• Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
• Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate superimposed infection
• Teach patient to drink adequate fluids
• Teach patient to avoid hazardous activities until reaction is known

**BLACK BOX WARNING:** Advise patient to report loss of hearing, ringing, roaring in ears; feeling of fullness in the head

### Evaluation

**Positive therapeutic outcome**

• Absence of signs/symptoms of infection (WBC $<10{,}000/mm^3$, temp WNL, absence of red, draining wounds)
• Reported improvement in symptoms of infection

## TREATMENT OF OVERDOSE:

Withdraw product, hemodialysis

## gentamicin ophthalmic

*See Appendix B*

## gentamicin topical

*See Appendix B*

**⚠ HIGH ALERT**

# glimepiride (Rx)

(gly-meh'pih-ride)
**Amaryl**

# glipiZIDE (Rx)

(glip-i'zide)
**Glucotrol, Glucotrol XL**
*Func. class.:* Antidiabetic
*Chem. class.:* Sulfonylurea (2nd generation)



**Do not confuse:** glipiZIDE/glucotrol/glyBURIDE

## ACTION:

Causes functioning β cells in pancreas to release insulin, leading to drop in blood glucose levels; may improve insulin binding to insulin receptors or increase the number of insulin receptors with prolonged administration; may also reduce basal hepatic glucose secretion; not effective if patient lacks functioning β cells

**Therapeutic outcome:** Decrease in polyuria, polydipsia, polyphagia, clear sensorium, absence of dizziness, stable gait

## USES:

Type 2 diabetes mellitus

## CONTRAINDICATIONS

Hypersensitivity to sulfonylureas/sulfonamides, type 1 diabetes, diabetic ketoacidosis

**Precautions:** Pregnancy, geriatric, cardiac disease, severe renal/hepatic disease, G6PD deficiency

## DOSAGE AND ROUTES

### Glimepiride

**Adult:** PO 1-2 mg/day with breakfast, then increase by ≤2 mg/day at q1-2wk, max 8 mg/day
**Geriatric:** PO 1 mg/day, may increase if needed

### Renal/Hepatic dose

**Adult:** PO 1 mg/day with breakfast, may titrate upward as needed

### GlipiZIDE

**Adult:** PO 5 mg initially before breakfast, then increase by 2.5-5 mg after several days, to desired response; max 40 mg/day in divided doses or 15 mg/dose; (XL) PO 5 mg/day with breakfast, may increase to 10 mg/day; max 20 mg/day
**Geriatric:** PO 2.5 mg/day, may increase if needed

### Hepatic dose

**Adult:** PO 2.5 mg initially, then increase to desired response; max 40 mg/day in divided doses or 15 mg/dose

**Available forms:** Glimepiride: tabs 1, 2, 4 mg; glipiZIDE: tabs 5, 10 mg scored; EXT REL tabs 2.5, 5, 10 mg

### Implementation

- Do not break, crush, or chew ext rel tabs
- Convert from other oral hypoglycemic agents or insulin dosage of <40 units/day; change may be made without gradual dosage change
- Patients taking >40 units/day of insulin convert gradually by receiving oral hypoglycemic agents and 50% of previous insulin dosage for 3-5 days
- Monitor serum or urine glucose and ketones 3 ×/day during conversion
- **GlipiZIDE:** Give 30 min before meals (regular release); with breakfast (ext rel)
- **Glimepiride:** with breakfast; if patient is NPO, may need to hold dose to prevent hypoglycemia
- Give tab crushed and mixed with meal or fluids for patients with difficulty swallowing
- For severe hypoglycemia give **IV** $D_{50}W$, then **IV** dextrose solution
- Store in tight container in cool environment

## ADVERSE EFFECTS

**CNS:** *Headache, weakness, dizziness, drowsiness,* tinnitus, fatigue, vertigo
**ENDO:** Hypoglycemia
**GI:** Hepatotoxicity, cholestatic jaundice, nausea, vomiting, diarrhea, heartburn
**HEMA:** Leukopenia, thrombocytopenia, agranulocytosis, aplastic anemia, increased AST, ALT, alkaline phosphatase, pancytopenia, hemolytic anemia
**INTEG:** Rash, allergic reactions, pruritus, urticaria, eczema, photosensitivity, erythema, allergic vasculitis
SYST: Serious hypersensitivity

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Completely absorbed, GI tract |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Via kidneys |
| **Half-life** | 2-4 hr; 5 hr glimepiride |

### Pharmacodynamics

| | glipiZIDE | glimepiride |
|---|---|---|
| **Onset** | 1-1½ hr | |
| **Peak** | 1-2 hr | 2-3 hr |
| **Duration** | 10-12 hr | |

## INTERACTIONS

### Individual drugs

Charcoal, cholestyramine, diazoxide, isoniazid, rifampin: possible decreased action of glipiZIDE
Chloramphenicol, cimetidine, clarithromycin, clofibrate, fenfluramine, fluconazole, gemfibrozil, guanethidine, insulin, methyldopa, phenylbutazone, probenecid, sulfinpyrazone, voriconazole: increased hypoglycemia, monitor blood glucose
Digoxin: increased action of digoxin, cycloSPORINE

### Drug classifications

Androgens, anticoagulants, fibric acid derivatives, $H_2$-antagonists, magnesium salts, MAOIs, NSAIDs, salicylates, sulfonamides, tricyclics, urinary acidifiers: increased hypoglycemia
β-Blockers: may mask symptoms of hypoglycemia
Diuretics (thiazide), corticosteroids, hydantoins, colesevelam, urinary alkalinizers: possible decreased action of glipiZIDE
Glycosides: increased action of glycosides

### Drug/herb

Garlic, horse chestnut: increased antidiabetic effect
Chromium: decreased antidiabetic effect
Chromium, coenzyme Q10, fenugreek, ginseng: increased or decreased hypoglycemic effect
Green tea: decreased hypoglycemic effect

### Drug/lab test

Increase: AST, ALT, LDH, BUN, creatinine
Decrease: Platelets, WBC, sodium

## NURSING CONSIDERATIONS

### Assessment

- **Assess for hypoglycemic/hyperglycemic reactions** that can occur soon after meals; hypoglycemic reactions (sweating, weakness, dizziness, anxiety, tremors, hunger); hyperglycemic reactions; A1c (baseline, q3mo) during treatment
- **Blood dyscrasias:** Monitor CBC
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, use only if benefits outweigh fetal risk, breastfed infant may be hypoglycemic

### Patient/family education

- **Teach patient to check for symptoms of cholestatic jaundice:** dark urine, pruritus, yellow sclera; if these occur, prescriber should be notified
- Teach patient to use capillary blood glucose test
- Teach patient to report bleeding, bruising, weight gain, edema, SOB, weakness, sore throat, swelling in ankles, rash
- Teach patient symptoms of hypo/hyperglycemia, what to do about each
- Instruct patient that product must be continued on daily basis; explain consequence of discontinuing product abruptly

- Caution patient to avoid OTC medications unless approved by a prescriber
- Teach patient that diabetes is a lifelong illness; that this product is not a cure
- Teach patient to avoid alcohol; inform about disulfiram reaction (nausea, headache, cramps, flushing, hypoglycemia)
- Instruct patient that all food included in diet plan must be eaten to prevent hypoglycemia
- Advise patient to use sunscreen or stay out of the sun to prevent burns
- Advise patient to carry/wear emergency ID and carry a glucagon emergency kit for emergency purposes; also prescriber name, phone number, and medications taken
- Teach patient ext rel tab may appear in stool

### Evaluation

**Positive therapeutic outcome**

- Decrease in polyuria, polydipsia, polyphagia; clear sensorium; absence of dizziness; stable gait
- Improved serum glucose, A1c

**⚠ HIGH ALERT**

## glyBURIDE (Rx) (glibenclamide)

(glye′byoor-ide)

**DiaBeta, Euglucon, Glynase PresTab**

*Func. class.:* Antidiabetic

*Chem. class.:* Sulfonylurea (2nd generation)

**Do not confuse:** glyBURIDE/Glucotrol/glipiZIDE, DiaBeta/Zebeta

**ACTION:** Causes functioning β cells in pancreas to release insulin, leading to drop in blood glucose levels; may improve insulin binding to insulin receptors and increase number of insulin receptors with prolonged administration; may also reduce basal hepatic glucose secretion; not effective if patient lacks functioning β cells

**Therapeutic outcome:** Decrease in polyuria, polydipsia, polyphagia, clear sensorium, absence of dizziness, stable gait

**USES:** Type 2 diabetes mellitus

## CONTRAINDICATIONS

Hypersensitivity to sulfonylureas, type 1 diabetes, diabetic ketoacidosis, renal failure

**Precautions:** Pregnancy, geriatric, cardiac/thyroid disease, severe renal/hepatic disease, severe hypoglycemic reactions, sulfonamide/sulfonylurea hypersensitivity, G6PD deficiency

## DOSAGE AND ROUTES

### To replace insulin

**Adults:** PO if insulin was <40 U/day, switch directly when glyBURIDE is stopped; if insulin <20 U/day give 2.5-5 mg or (1.5-3 mg micronized); if insulin was 20-40 U/day give 5 mg or (3 mg micronized); if insulin >40 U/day, give 5 mg (3 mg micronized) initially with 50% insulin dose, gradually taper insulin and increase glyBURIDE

### DiaBeta

**Adult:** PO 1.25-5 mg initially, then increased to desired response at weekly intervals up to 20 mg/day; may be given as a single or divided dose

**Geriatric:** PO 1.25 mg initially, then increased to desired response; max 20 mg/day, maintenance 1.25-20 mg/day

### Renal dose

**Adult:** PO CCr 50 ml/min, use conservative dose

**Geriatric:** PO 0.75-3 mg/day, may increase by 1.5 mg/wk

### Glynase PresTab (micronized)

**Adult:** PO 1.5-3 mg/day initially, may increase by 1.5 mg/wk, max 12 mg/day

**Geriatric:** PO 0.75-3 mg/day, may increase by 1.5 mg/wk

**Available forms:** Tabs (DiaBeta) 1.25, 2.5, 5 mg; tabs micronized (Glynase PresTab) 1.5, 3, 6 mg

### Implementation

- Conversion from other oral hypoglycemic agents or insulin dosage of <40 units/day; change may be made without gradual dosage change
- Patients taking >40 units/day of insulin convert gradually by receiving oral hypoglycemic agents and 50% of previous insulin dosage for 3-5 days
- Monitor serum or urine glucose and ketones 3 ×/day during conversion
- Give product 30 min before breakfast; if large dose is required, may be divided into two; give with meals to decrease GI upset and provide best absorption; if patient is NPO, may need to hold dose to avoid hypoglycemia, take at same time each day
- Give tab crushed and mixed with meal or fluids for patients with difficulty swallowing
- For severe hypoglycemia, give **IV** $D_{50}W$, then **IV** dextrose sol
- Store in tight container in cool environment

## ADVERSE EFFECTS

**CNS:** *Headache, weakness,* paresthesia, tinnitus, fatigue, vertigo

**EENT:** Blurred vision

**ENDO:** Hypoglycemia
**GI:** Nausea, fullness, heartburn, hepatoxicity, cholestatic jaundice, vomiting, diarrhea, hepatic failure (rare)
**HEMA:** Leukopenia, thrombocytopenia, agranulocytosis, aplastic anemia, increased AST, ALT, alkaline phosphatase
**INTEG:** Rash, allergic reactions, pruritus, urticaria, eczema, photosensitivity, erythema
**MS:** Joint pains, vasculitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Completely absorbed GI tract |
| **Distribution** | 99% plasma protein binding |
| **Metabolism** | Liver |
| **Excretion** | Urine, feces (metabolites), crosses placenta |
| **Half-life** | 10 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 2 hr |
| **Peak** | 2-4 hr |
| **Duration** | 24 hr |

## INTERACTIONS

### Individual drugs

Bosentan: increased LFTs, avoid concurrent use
Charcoal, cholestyramine, isoniazid, rifampin thyroid: decreased action of glyBURIDE
Clarithromycin, chloramphenicol, fenfluramine, fluconazole, gemfibrozil, guanethidine, insulin, methyldopa, phenylbutazone, probenecid, sulfinpyrazone: increased hypoglycemia
Colesevelam: increased triglyceride levels
CycloSPORINE: increased action of cycloSPORINE
Diazoxide: both products may have action decreased
Digoxin: increased level

### Drug classifications

Androgens, anticoagulants, antidepressants (tricyclics), β-blockers, $H_2$-antagonists, magnesium salts, MAOIs, NSAIDs, salicylates, sulfonamides, urinary acidifiers: increased hypoglycemia, voriconazole, monitor blood glucose
β-Adrenergic blockers: increased masking of symptoms of hypoglycemia
Diuretics (thiazide), hydantoins, urinary alkalinizers, corticosteroids, phenothiazines, oral contraceptives, estrogens: decreased action of glyBURIDE, monitor blood glucose

### Drug/herb

Garlic, horse chestnut: increased antidiabetic effect
Green tea: decreased hypoglycemic effect

### Drug/lab test

Increased: AST, ALT, LDH, BUN, creatinine, alkaline phosphatase
Decrease: Hgb, sodium, glucose, platelets, WBC

## NURSING CONSIDERATIONS

### Assessment

- Assess for hypo/hyperglycemic reactions that can occur soon after meals; hypoglycemic reactions (sweating, weakness, dizziness, anxiety, tremors, hunger); hyperglycemic reactions; A1c (baseline, q3mo) during treatment
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, insulin is usually used in pregnancy, breastfed infant may be hypoglycemic
- **Blood dyscrasias:** Monitor CBC, check liver function tests periodically, AST, LDH, and renal studies: BUN, creatinine during treatment
- **Beers:** Avoid in older adults, severe prolonged hypoglycemia

### Patient/family education

- **Teach patient to check for symptoms of cholestatic jaundice:** dark urine, pruritus, yellow sclera; if these occur, prescriber should be notified
- Teach patient to use capillary blood glucose test
- **Teach patient symptoms of hypo/hyperglycemia,** what to do about each
- Instruct patient that product must be continued on daily basis; explain consequence of discontinuing product abruptly
- Teach patient to report bleeding, bruising, weight gain, edema, shortness of breath, weakness, sore throat
- Teach patient to take product in AM to prevent hypoglycemic reactions at night
- Caution patient to avoid OTC medications unless approved by a prescriber
- Teach patient that diabetes is a lifelong illness; that this product is not a cure
- Instruct patient that all food included in diet plan must be eaten to prevent hypoglycemia
- Advise patient to carry/wear emergency ID and carry a glucagon emergency kit for emergency purposes: have sugar packets available; also prescriber name, phone number, and medications
- Advise patient to use sunscreen or stay out of the sun to prevent burns

### Evaluation

#### Positive therapeutic outcome

- Decrease in polyuria, polydipsia, polyphagia; clear sensorium; absence of dizziness; stable gait
- Improved serum glucose, A1c

## golimumab (Rx)

(goal-lim'yu-mab)
**Simponi, Simponi Aria**
*Func. class.:* Antirheumatic agent (disease modifying), immunomodulator
*Chem. class.:* Monoclonal antibody, DMARDS, tumor necrosis factor (TNF) modifier

**ACTION:** Monoclonal antibody specific for human tumor necrosis factor (TNF); elevated levels of TNF are found in patients with rheumatoid arthritis

**Therapeutic outcome:** Decreased pain, decreased inflammation in joints, better ROM

**USES:** Rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis, ulcerative colitis

## CONTRAINDICATIONS

Hypersensitivity active infections

**Precautions:** Pregnancy, breastfeeding, children, geriatric patients, CNS demyelinating disease, Guillain-Barré syndrome, HF, hepatitis B carriers, blood dyscrasias, surgery, MS, neurological disease, diabetes, immunosuppression

**BLACK BOX WARNING:** Infection

## DOSAGE AND ROUTES

### Moderate to severe rheumatoid arthritis

**Adult:** SUBCUT 50 mg qmo; for RA give with methotrexate; IV (Simponi Aria only) 2 mg/kg over 30 min, repeat in 4 wk, then q8wk; give with methotrexate

### Ankylosing spondylitis/psoriatic arthritis

**Adult:** SUBCUT 50 mg monthly

### Moderate to severe ulcerative colitis

**Adult:** SUBCUT 200 mg for 1 dose, then 100 mg in 2 wk; maintenance 100 mg q4wk starting at wk 6

**Available forms:** Inj 50 mg/0.5 ml, 100 mg/ml prefilled syringe, SmartJect Auto Injector; inj 50 mg/4 ml single-use vial

### Implementation

**SUBCUT route**

- Refrigerate; do not freeze; allow to warm to room temp before using
- Visually inspect solution for particulate or discoloration, solution should be clear to slightly opalescent and colorless to slightly yellow; there may be tiny white particles; do not shake
- ***SmartJect autoinjector:*** Allow to reach room temperature for 30 min prior to use, remove cap, inject within 5 min of removing cap, do not put cap back on, place the open end against the inj site at a 90-degree angle, without pushing button, push the injector firmly against the skin, press the button once and release, listen for the first click, wait for the second click or 15 sec, and remove the injector; do not rub site
- ***Prefilled syringe:*** Allow to warm to room temperature for 30 min, remove needle cover by pulling straight off, do not twist or recap, inject within 5 min of needle cover removal, hold the syringe in one hand like a pencil and use the other to pinch the skin, inject needle at a 45-degree angle, push plunger down as far as it will go, keep pressure on the plunger head and remove needle from skin, remove pressure from the plunger head, the needle guard will cover the needle, do not rub site

**IV route (Simponi Aria)**

- Calculate number of vials needed; do not shake; dilute total volume of product in NS to yield 100 ml for infusion, slowly add product, mix gently
- Infuse over 30 min; use infusion set with in-line, sterile, non-pyrogenic, low-protein binding filter (≤0.22 mm pore size)

## ADVERSE EFFECTS

**CNS:** Dizziness, paresthesia, CNS demyelinating disorder, weakness
**CV:** Hypertension, HF
**GI:** Hepatitis
**HEMA:** Agranulocytosis, aplastic anemia, leukopenia, polycythemia, thrombocytopenia, pancytopenia
**INTEG:** Psoriasis
**MISC:** Increased risk of cancer, antibody development to this drug, risk of infection (TB, invasive fungal infections, other opportunistic infections); may be fatal, inj site reactions

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Terminal 2 wk |

### Pharmacodynamics

IV peak 12 wk,
SUBCUT peak 2-5 days

## INTERACTIONS

### Individual drugs

Abatacept, adalimumab, anakinra, etanercept, immunosuppressants, infliximab, rilonacept, rituximab: increased infection, avoid concurrent use

Warfarin, cycloSPORINE, theophylline: dosage change may be needed

### Drug classifications

Live vaccines: do not give concurrently or within 3 mo; immunization should be brought up to date before treatment

### Drug/lab tests

Increase: LFTs

Decrease: Platelets, WBC

## NURSING CONSIDERATIONS

### Assessment

- **Assess for pain,** stiffness, ROM, swelling of joints during treatment
- Check for inj site pain, swelling; usually occur after 2 inj (4-5 days)

**BLACK BOX WARNING: Check for infections** (fever, flulike symptoms, dyspnea, change in urination, redness/swelling around any wounds), stop treatment if present; some serious infections including sepsis may occur, may be fatal; patients with active infections should not be started on this product

- **Blood dyscrasias:** CBC, differential before and periodically during treatment

**BLACK BOX WARNING: TB:** Obtain TB skin test before starting treatment; treat latent TB before starting therapy, continue to monitor for TB, even if TB test is negative

**BLACK BOX WARNING: Neoplastic disease:** May occur in those <18 yr; avoid use in those with known malignancies, monitor for secondary malignancies during treatment

- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed, excretion unknown
- **HF:** Monitor B/P, pulse, edema, shortness of breath, may occur or worsen with treatment
- **Psoriasis:** May occur or worsen; LFTs, hepatitis B serology, may reactivate HBV

### Patient/family education

- Teach patient about self-administration if appropriate: inj should be made in thigh, abdomen, upper arm; rotate sites at least 1 inch from old site; do not inject in areas that are bruised, red, hard
- Advise patient that if medication is not taken when due, inject next dose as soon as remembered and inject next dose as scheduled

**BLACK BOX WARNING:** Teach patient to report signs, symptoms of infection, allergic reaction, or lupuslike syndrome

- **HBV infection:** Test for HBV before starting treatment, HBV can be fatal in HBV carriers, monitor

### Evaluation

**Positive therapeutic outcome**

- Decreased inflammation, pain in joints

## goserelin (Rx)

(goe'se-rel-lin)

**Zoladex**

*Func. class.:* Gonadotropin-releasing hormone, antineoplastic

*Chem. class.:* Synthetic decapeptide analog of LHRH

**ACTION:** Inhibitor of pituitary gonadotropin secretion; initially increases LH and FSH, with increases in testosterone, reduction in sex steroid levels (substitute serum testosterone levels)

**Therapeutic outcome:** Decrease in tumor size and spread of malignant cells

**USES:** Advanced prostate cancer Stage B2-C (10.8 mg); endometriosis, advanced breast cancer, endometrial thinning (3.6 mg)

## CONTRAINDICATIONS

Pregnancy **D** (breast cancer), **X** (endometriosis), breastfeeding, nondiagnosed vaginal bleeding, children, 10.8 mg dose in women, hypersensitivity to LHRH, LHRH-agonist analogs

**Precautions:** Spinal cord decompression, renal disease, bone mineral density loss

## DOSAGE AND ROUTES

**Adult:** SUBCUT 3.6 mg q4wk (implant) or 10.8 mg q12wk

### Endometrial thinning

**Adult:** SUBCUT 1-2 depot inj (usually 1 depot, surgery performed at 4 wk); (if 2 depots, surgery performed 2-4 wk after 2nd depot)

**Available forms:** Depot inj 3.6, 10.8 mg

### Implementation

**Depot**

- Give SUBCUT using implant, inserted by qualified person into upper subcutaneous tissue in abdominal wall q28days or q12wk (10.8 mg), do not attempt to remove air bubbles from syringe, assess for injection site reaction

## ADVERSE EFFECTS

**CNS:** Headaches, spinal cord compression, anxiety, depression, dizziness, insomnia, lethargy, hot flashes, emotional lability
**CV:** Dysrhythmia, cerebrovascular accident, hypertension, MI, chest pain, HF; sudden cardiac death, stroke (men)
**ENDO:** Gynecomastia, breast tenderness, hot flashes; hyperglycemia, diabetes (men)
**GI:** Nausea, vomiting, constipation, diarrhea, ulcer
**GU:** *Spotting, breakthrough bleeding, decreased libido,* renal insufficiency, urinary obstruction, urinary tract infection, impotence
**INTEG:** Rash, pain on inj, diaphoresis
**MS:** Osteoneuralgia
**RESP:** *COPD, URI*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 4½ hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 14-28 days |
| **Duration** | Treatment length |

## INTERACTIONS

### Drug/lab test

Increased: alkaline phosphatase, estradiol, FSH, LH
Decreased: progesterone

## NURSING CONSIDERATIONS

### Assessment

- **Reproductive studies:** monitor pelvic ultrasound, pelvic exam, PSA, serum estradiol/testosterone, pregnancy test prior to therapy
- Monitor I&O ratios; palpate bladder for distention in urinary obstruction
- **Cancer metastases:** monitor for relief of bone pain (back pain), change in motor function
- Blood studies: monitor acid phosphatase; calcium in breast/prostate cancer, hypercalcemia may occur
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

- Caution patient that gynecomastia and postmenopausal symptoms may occur but will decrease after treatment is discontinued; that bone pain may increase, then decrease, may use analgesics
- Teach patient to contact prescriber for difficulty urinating, hot flashes occur during treatment
- Advise patient not to breastfeed while taking product; use effective nonhormonal contraception
- Advise patient to notify prescriber if chest pain, weakness, difficulty breathing occur; may indicate MI or stroke

### Evaluation

**Positive therapeutic outcome**

- More normal levels of PSA, acid phosphatase, alkaline phosphatase; testosterone level of <25 mg/dl



## granisetron (Rx)

(grane-iss'e-tron)
**Granisol, Kytril, Sancuso, Sustol**
*Func. class.:* Antiemetic
*Chem. class.:* 5-$HT_3$ receptor antagonist

**ACTION:** Prevents nausea, vomiting by blocking serotonin peripherally, centrally, and in the small intestine

**Therapeutic outcome:** Absence of nausea and vomiting

**USES:** Prevention of nausea, vomiting associated with cancer chemotherapy including high-dose CISplatin, radiation

**Unlabeled uses:** Acute nausea, vomiting after surgery

## CONTRAINDICATIONS

Hypersensitivity to this product or benzyl alcohol

**Precautions:** Pregnancy, breastfeeding, children, geriatric, ondansetron/palonosetron/dolasetron hypersensitivity, cardiac dysrhythmias, cardiac/hepatic disease/GI, electrolyte imbalances

## DOSAGE AND ROUTES

### Nausea, vomiting in chemotherapy

**Adult and child ≥2 yr: IV** 10 mcg/kg over 5 min, 30 min before the start of cancer chemotherapy, TD apply 1 patch (3.1 mg/24 hr) to upper arm 24-48 hr before chemotherapy; patch may be worn up to 7 days
**Adult:** PO 1 mg bid, give 1st dose 1 hr before chemotherapy and next dose 12 hr after 1st or 2 mg as a single dose anytime within 1 hr prior to chemotherapy or radiation

### Nausea, vomiting in radiation therapy

**Adult:** PO 2 mg/day 1 hr prior to radiation

**Available forms:** Inj 0.1 mg/ml, 1 mg/ml; tabs 1 mg, oral sol 2 mg/10 ml; patch TD 3.1 mg/24 hr

## Implementation

### PO route

- Give dose 1 hr prior to chemotherapy/radiation and another dose 12 hr after the first
- **Transdermal:** Apply to clean, dry skin on upper arm q24-48hr prior to chemotherapy
- Do not cut in pieces
- Apply immediately after opening pouch

### IV route

- May give undiluted over 30 sec via Y-site

### IV intermittent infusion route

- Dilute in 0.9% NaCl for inj or $D_5W$ (20-50 ml), give over 5-15 min, ½ hr prior to chemotherapy
- Store at room temp for 24-hr dilution, do not freeze vials

**Y-site compatibilities:** Acetaminophen, alemtuzumab, alfentanil, allopurinol, amifostine, amikacin, aminophylline, amphotericin B cholesteryl, ampicillin, ampicillin/sulbactam, amsacrine, aztreonam, bleomycin, bumetanide, buprenorphine, butorphanol, calcium gluconate, CARBOplatin, carmustine, ceFAZolin, cefepime, cefonicid, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chlorproMAZINE, cimetidine, ciprofloxacin, CISplatin, cladribine, clindamycin, cyclophosphamide, cytarabine, dacarbazine, DACTINomycin, DAUNOrubicin, dexamethasone, diphenhydrAMINE, DOBUTamine, DOPamine, DOXOrubicin, DOXOrubicin liposome, doxycycline, droperidol, enalaprilat, etoposide, famotidine, filgrastim, floxuridine, fluconazole, fluorouracil, fludarabine, furosemide, gallium, ganciclovir, gentamicin, haloperidol, heparin, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, leucovorin, LORazepam, magnesium sulfate, melphalan, meperidine, mesna, methotrexate, methylPREDNISolone, metoclopramide, metroNIDAZOLE, mezlocillin, miconazole, minocycline, mitoMYcin, mitoXANtrone, morphine, nalbuphine, netilmicin, ofloxacin, PACLitaxel, piperacillin, piperacillin/tazobactam, plicamycin, potassium chloride, prochlorperazine, promethazine, propofol, ranitidine, sargramostim, sodium bicarbonate, streptozocin, teniposide, thiotepa, ticarcillin, ticarcillin/clavulanate, tobramycin, trimethoprim/sulfamethoxazole, vancomycin, vinBLAStine, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

**Y-site incompatibilities:** Amphotericin B colloidal, diazepam, phenytoin

**Solution compatibilities:** $D_5W$, 0.9% NaCl

### Transdermal route

- Apply to dry, clean, intact skin of upper, outer arm 24 hr prior to chemotherapy; firmly press on skin; keep on during chemotherapy; can bathe; avoid swimming, whirlpool; remove ≥24 hr after chemotherapy

## ADVERSE EFFECTS

**CNS:** *Headache, asthenia,* anxiety, dizziness, EPS (rare)
**CV:** Hypertension, QT prolongation
**GI:** Diarrhea, *constipation,* increased AST, ALT, *nausea*
**HEMA:** Leukopenia, anemia, thrombocytopenia
**MISC:** Rash, bronchospasm, serotonin syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Unknown |
| **Half-life** | 10-12 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Amoxapine, arsenic, chloroquine, cloZAPine, dasatinib, dolasetron, dronedarone, droperidol, erythromycin, flecainide, fluconazole, haloperidol, lapatinib, maprotiline, methadone, octreotide, ondansetron, palonosetron, pentamidine, pimozide, posaconazole, propafenone, ranolazine, risperiDONE, sertindole, SUNItinib, tacrolimus, telithromycin, troleandomycin, vardenafil, voriconazole, vorinostat, ziprasidone: increased QT prolongation
Apomorphine: Increase: Hypotension, do not use together

### Drug classifications

Antipsychotics: increased EPS
β-blockers, class I, III antidysrhythmics, halogenated/local anesthetics, phenothiazines, tricyclics: increased QT prolongation

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for absence of nausea, vomiting during chemotherapy

- **Assess patient for hypersensitive reaction:** rash, bronchospasm
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk
- **Extrapyramidal symptoms:** Grimacing, shuffling gait, tremors, involuntary movements, rare
- **QT prolongation:** Monitor ECG in those with heart disease, renal disease, or the elderly
- **Serotonin syndrome:** Assess for hallucinations, seizures, diaphoresis, dizziness, flushing, hyperthermia, nausea, vomiting, diarrhea

### Patient/family education

- Advise patient to report diarrhea, constipation, rash, or changes in respirations
- Teach patient to take second dose of PO 12 hr after first dose
- Teach patient that allergic reactions can occur up to 7 days after use (ext rel) or later (SUBCUT)
- **Serotonin syndrome:** Teach patient to report mental changes, including, agitation, hallucinations, dizziness, sweating, flushing, tremors, seizures, discontinue immediately and notify prescriber

### Evaluation

**Positive therapeutic outcome**

- Absence of nausea, vomiting during cancer chemotherapy

## guaiFENesin (Rx, OTC)

(gwye-fen′e-sin)

**Alfen, Altarussin, Balminil, Benylin Chest Congestion Extra Strength, Benylin E, Bidex, Bismutal, Bronchophan, Expectorant, Calmylin Expectorant, Cough Syrup Expectorant, Diabetic Tussin, Expectorant Syrup, Guiatuss, Jack & Jill, Miltuss EX, Mucinex, Naldecon Senior EX, Organidin NR, Robitussin GuaiFENesin, Scot-Tussin Expectorant, Siltussin DAS, Siltussin SA, Vicks Chest Congestion Relief, Vicks DayQuil Mucus Control**

*Func. class.:* Expectorant

**Do not confuse:** guaiFENesin/guanFACINE
Mucinex/Mucomyst

**ACTION:** Increases the volume and reduces the viscosity of secretions in the trachea and bronchi to facilitate secretion removal

**Therapeutic outcome:** Decreased cough

**USES:** Productive and nonproductive cough

## CONTRAINDICATIONS

Hypersensitivity, chronic persistent cough

**Precautions:** Pregnancy, breastfeeding, HF, asthma, emphysema, fever

## DOSAGE AND ROUTES

**Adult and child ≥12 yr:** PO 200-400 mg q4hr, or EXT REL 600-1200 mg q12hr; max 2.4 g/day
**Child 6-11 yr:** PO 100-200 mg q4hr or EXT REL 600 mg q12hr; max 1.2 g/day
**Child 2-5 yr:** PO: 50-100 mg q4hr; max 600 mg/day, EXT REL 300 mg q12hr, max 600 mg/day

**Available forms:** Tabs 100, 200, 400 mg; ext rel tabs 600, 1200 mg; syr 100 mg/5 ml; oral sol 100 mg/5 ml; oral granules 50, 100 mg/packet; caps 200 mg; liquid 100, 200 mg/5 ml

### Implementation

- Store at room temperature; provide room humidification to assist with liquefying secretions
- Avoid fluids for ½ hr after administration

## ADVERSE EFFECTS

**CNS:** Drowsiness, headache, dizziness
**GI:** Nausea, anorexia, vomiting, diarrhea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 1 hr |

### Pharmacodynamics

| | PO | PO–EXT REL |
|---|---|---|
| **Onset** | ½ hr | Unknown |
| **Peak** | Unknown | Unknown |
| **Duration** | 4-6 hr | 12 hr |

## NURSING CONSIDERATIONS

### Assessment

- **Assess cough:** type, frequency, character, including characteristics of sputum; lung sounds bilaterally; fluids should be increased to 2 L/day to decrease secretion viscosity (thickness)
- **Pregnancy/breastfeeding:** Use only if benefits outweigh risk

## Patient/family education

- Caution patient to avoid driving, other hazardous activities if drowsiness occurs (rare)
- Advise patient to avoid smoking, smoke-filled rooms, perfumes, dust, environmental pollutants, cleansers
- Instruct patient to notify prescriber if dry, nonproductive cough lasts over 7 days
- Teach patient to avoid if breastfeeding
- Advise patient to avoid in child <2 yr

## Evaluation

### Positive therapeutic outcome

- Absence of dry cough
- Thinner, more productive cough that raises secretions

gabapentin (Rx)
ganciclovir ophthalmic
gemfibrozil (Rx)
gentamicin ophthalmic
glipiZIDE (Rx)
goserelin (Rx)
galantamine (Rx)
gatifloxacin ophthalmic
gemifloxacin (Rx)
gentamicin topical
glyBURIDE (Rx) (glibenclamide)
granisetron (Rx)
ganciclovir (Rx)
gemcitabine (Rx)
gentamicin (Rx)
glimepiride (Rx)
golimumab (Rx)
guaiFENesin (Rx, OTC)

## halcinonide topical

*See Appendix B*

## haloperidol (Rx)

(hal-oh-pehr'ih-dol)
**Novo-Peridol** ✱,
## haloperidol decanoate (Rx)
## haloperidol lactate (Rx)
**Haldol**
*Func. class.:* Antipsychotic/neuroleptic
*Chem. class.:* Butyrophenone

**Do not confuse:** haloperidol/Halotestin

**ACTION:** Depresses cerebral cortex, hypothalamus, limbic system, which control activity and aggression; blocks neurotransmission produced by dopamine at synapse; exhibits strong α-adrenergic, anticholinergic blocking action; mechanism for antipsychotic effects unclear

**Therapeutic outcome:** Decreased signs and symptoms of psychosis

**USES:** Psychotic disorders, control of tics, vocal utterances in Tourette's syndrome, short-term treatment of hyperactive children showing excessive motor activity, prolonged parenteral therapy in chronic schizophrenia, organic mental syndrome with psychotic features, emergency sedation of severely agitated or delirious patients, ADHD

**Unlabeled uses:** Nausea, vomiting in chemotherapy, hiccups, autism, migraine headache

### CONTRAINDICATIONS

Children <3 yr, hypersensitivity, coma, Parkinson's disease, CNS depression

**Precautions:** Pregnancy, breastfeeding, geriatric, seizure disorders, hypertension, hepatic/cardiac/pulmonary disease, prostatic hypertrophy, hyperthyroidism, thyrotoxicosis, blood dyscrasias, brain damage, bone marrow depression, alcohol and barbiturate withdrawal states, angina, epilepsy, urinary retention, closed-angle glaucoma

**BLACK BOX WARNING:** Dementia; increased mortality in elderly patients with dementia-related psychosis

### DOSAGE AND ROUTES

#### Acute psychosis

**Adult and child >12 yr: IM/IV** (lactate) 2-10 mg, may repeat q1hr, convert to **PO** as soon as possible, **PO** should be 150% of total parenteral dose required

**Child 6-12 yr: IM/IV** (lactate) (unlabeled) 1-3 mg q4-8hr, max 0.15 mg/kg/day, switch to **PO** as soon as possible

#### Chronic psychosis

**Adult: IM** (decanoate) 50-200
**Child 3-12 yr: PO/IM** 0.05-0.15 mg/kg/day

#### Tourette's syndrome

**Adult and adolescent: PO** 0.5-2 mg bid-tid, increased until desired response occurs
**Elderly: PO** 0.5-2 mg bid-tid; may increase gradually
**Child 3-12 yr or weighing 15-40 kg: PO** 0.25-0.5 mg/day in 2-3 divided doses, increase by 0.05-0.075 mg q5-7days, max 0.15 mg/kg/day

#### Nonpsychotic behavior disorders

**Child:** 3-12 yr PO 0.05-0.075 mg/kg in 2-3 divided doses, max 6 mg/day

**Available forms:** Tabs 0.5, 1, 2, 5, 10, 20 mg; **lactate:** oral sol 2 mg/ml; inj 5 mg/ml; **decanoate:** 50 mg/ml, 100 mg/ml

#### Implementation

**PO route—oral liquid**
- Give product in liquid form mixed in glass of juice or caffeine-free cola if hoarding is suspected; do not mix in caffeine drinks, tannics, pectins
- Give decreased dosage in geriatric because of slower metabolism
- Give PO with full glass of water, milk; or give with food to decrease GI upset
- Give antacids 2 hr before or after this product
- Store in tight, light-resistant container; oral sol in amber bottle
- Avoid skin contact with oral susp or sol: may cause contact dermatitis

**IM route**
- Inject in deep muscle mass, do not give SUBCUT; use 21-gauge 2-in needle; do not administer sol with a precipitate; give <3 ml per inj site; give slowly, may be painful
- Patient should remain lying down after IM inj for at least 30 min

**IV route (lactate) (unlabeled)**
- Give undiluted for psychotic episode at 5 mg/min
- Only use lactate for IV
- Closely monitor ECG for QT prolongation
- Switch to oral as soon as possible if needed; give first PO dose within 12-24 hr of last parenteral dose

**Y-site compatibilities:** alcohol 10%, dextrose 5%, alemtuzumab, amifostine, aminocaproic acid, amiodarone, amphotericin B liposome (AmBisome), amsacrine, anidulafungin, argatroban, Arsenic trioxide, asparaginase, atenolol, azithromycin, bleomycin, Cangrelor,

CARBOplatin, carmustine, Caspofungin, ceftaroline, cisatracurium, CISplatin, Cladribine, cloNIDine, codeine phosphate, cyclophosphamide, cytarabine, DACTINomycin, DAPTOmycin, DAUNOrubicin liposome, DAUNOrubicin, Dexmedetomidine, Dexrazoxane, diltiazem, DOCEtaxel, dolasetron, Doxacurium, DOXOrubicin, DOXOrubicin liposomal, epirubicin, eptifibatide, ertapenem, etoposide, etoposide phosphate, fenoldopam, filgrastim, Fludarabine, gatifloxacin, gemcitabine, granisetron, HYDROmorphone, IDArubicin, ifosfamide, irinotecan, Ketamine, lepirudin, leucovorin, levofloxacin, linezolid, LORazepam, mechlorethamine, melphalan, Mesna, methadone, metroNIDAZOLE, milrinone, MitoXANtrone, Mivacurium, morphine, moxifloxacin, mycophenolate mofetil, nesiritide, niCARdipine, octreotide, oritavancin, oxaliplatin, PAClitaxel (solvent/surfactant), palonosetron, pamidronate, pancuronium, PEMEtrexed, potassium acetate, propofol, QuinupristinDalfopristin, remifentanil, riTUXimab, rocuronium, Sodium acetate, tacrolimus, Teniposide, Thiotepa, tigecycline, tirofiban, topotecan, TPN (2-in-1), vecuronium, vinBLAStine, vinCRIStine, vinorelbine, voriconazole, zoledronic acid

## ADVERSE EFFECTS

**CNS:** *EPS, pseudoparkinsonism, akathisia, dystonia, tardive dyskinesia, drowsiness, headache,* seizures, neuroleptic malignant syndrome, confusion

**CV:** *Orthostatic hypotension,* hypertension, cardiac arrest, ECG changes, tachycardia, QT prolongation, sudden death

**EENT:** Blurred vision, glaucoma, dry eyes

**GI:** *Dry mouth, nausea, vomiting, anorexia, constipation,* diarrhea, jaundice, weight gain, ileus, hepatitis

**GU:** Urinary retention, urinary frequency, dysuria, enuresis, impotence, amenorrhea, gynecomastia

**INTEG:** *Rash,* photosensitivity, dermatitis

**HEMA:** Agranulocytosis, anemia, neutropenia, leukopenia

**RESP:** Laryngospasm, dyspnea, respiratory depression

**SYST:** Risk of death (dementia)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO, IM); decanoate (IM) absorbed slowly |
| **Distribution** | High concentrations in liver, crosses placenta, protein binding 92% |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | Terminal half-life 12-36 hr (metabolized) |

### Pharmacodynamics

| | PO | IM | IM (decanoate) |
|---|---|---|---|
| **Onset** | Erratic | ½ hr | 3-9 days |
| **Peak** | 2-6 hr | 30-45 min | 4-11 days |
| **Duration** | 8-12 hr | 4-8 hr | 3 wk |

## INTERACTIONS

### Individual drugs

Alcohol: increased effects of both products, oversedation

Amoxapine, chloroquine, cloZAPine, dasatinib, dolasetron, dronedarone, droperidol, erythromycin, flecainide, lapatinib, maprotiline, methadone, octreotide, ondansetron, palonosetron, pentamidine, pimozide, propafenone, ranolazine, risperiDONE, sertindole, SUNItinib, tacrolimus, telithromycin, troleandomycin, vardenafil, vorinostat, ziprasidone: increased QT prolongation, usually with IV use

CarBAMazepine: decreased effects of haloperidol

EPINEPHrine: increased toxicity

Levodopa: decreased effects of levodopa

Lithium: increased toxicity; decreased effects of lithium

PHENobarbital: decreased effects of haloperidol

### Drug classifications

Anticholinergics: increased anticholinergic effects

Barbiturate anesthetics: oversedation

β-Adrenergic blockers: increased effects of both products

Class IA, III antidysrhythmics, halogenated/local anesthetics, phenothiazines, tricyclics, β-blockers: increased QT prolongation

CNS depressants: oversedation

SSRIs, SNRIs: increased serotonin syndrome, increased neuroleptic malignant syndrome

### Drug/lab test

Increased: liver function tests

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Assess for dementia, affect, orientation, LOC, reflexes, gait, coordination, sleep pattern disturbances, risk for death in dementia-related psychosis

- **Mental status:** Mood, behavior, orientation, presence of delusions, hallucinations, baseline periodically

• Assess mental status: orientation, mood, behavior, presence and type of hallucinations before initial administration and monthly; this product should significantly reduce psychotic behavior
• Monitor I&O ratio; palpate bladder if low urinary output occurs, especially in geriatric; urinalysis is recommended before, during prolonged therapy
• Monitor bilirubin, CBC, liver function tests monthly
• Assess affect, orientation, LOC, reflexes, gait, coordination, sleep pattern disturbances
• Monitor B/P with patient sitting, standing, and lying; take pulse and respirations q4hr during initial treatment; establish baseline before starting treatment; report drops of ≥30 mm Hg; obtain baseline ECG, Q-wave and T-wave changes
• Check for dizziness, faintness, palpitations, tachycardia on rising; severe orthostatic hypotension is common
• **Assess for neuroleptic malignant syndrome:** hyperpyrexia, muscle rigidity, increased CPK, altered mental status; product should be discontinued immediately; if seizures, hypo/hypertension, tachycardia occur, notify prescriber immediately
• **Dehydration:** I&O, daily weight, lethargy, decreased thirst, low intake
• **Assess for EPS** including akathisia (inability to sit still, no pattern to movements), tardive dyskinesia (bizarre movements of the jaw, mouth, tongue, extremities), pseudoparkinsonism (ragged tremors, pill rolling, shuffling gait); an antiparkinsonian product should be prescribed
• Assess for constipation and urinary retention daily; if these occur, increase bulk, water in diet
• **Abrupt discontinuation:** Do not withdraw abruptly, taper
• **QT prolongation:** More common with IV use at high doses; monitor ECG in those with CV disease
• **Beers:** Avoid use in older adults except for schizophrenia, bipolar disorder, increased risk of stroke and cognitive decline, mortality
• **Pregnancy/breastfeeding:** No well-controlled studies, use in third trimester results in infant extrapyramidal symptoms, avoid breastfeeding

### Patient/family education

• Teach patient to use good oral hygiene; use frequent rinsing of mouth, sugarless gum for dry mouth; oral candidiasis may occur
• Advise patient to avoid hazardous activities until product response is determined and effects are known; dizziness, blurred vision are common
• Inform patient that orthostatic hypotension occurs often and to rise from sitting or lying position gradually; tell patient that in hot weather heat stroke may occur; take extra precautions to stay cool
• Instruct patient to avoid abrupt withdrawal of this product, or EPS may result; product should be withdrawn slowly
• Caution patient to avoid OTC preparations (cough, hay fever, cold) unless approved by prescriber, since serious product interactions may occur; avoid use with alcohol, CNS depressants since increased drowsiness may occur
• Tell patient to report impaired vision, jaundice, muscle twitching

### Evaluation

**Positive therapeutic outcome**

• Decrease in emotional excitement, hallucinations, delusions, paranoia, reorganization of patterns of thought, speech; improvement in specific behaviors
• Teach patient to use sunscreen, protective clothing, to minimize photosensitivity, avoid being overheated
• Teach patient to take as prescribed, not to use OTC, herbal products unless directed by prescriber
• Teach patient to use good oral hygiene, frequent sips of water, sugarless gum, candy for dry mouth

**TREATMENT OF OVERDOSE:** Lavage if orally ingested; provide airway; *do not induce vomiting*

**⚠ HIGH ALERT**

## heparin (Rx)

(hep′a-rin)

**BD Posiflush, Heparin Lock Flush, Hepalean, Heparin Leo, Hep-Lock, Hep-Lock U/P, Monoject Prefill, PosiHeparin Lock Flush**

*Func. class.:* Anticoagulant, antithrombotic

**Do not confuse:** heparin/Hespan

**ACTION:** Prevents conversion of fibrinogen to fibrin and prothrombin to thrombin by enhancing inhibitory effects of antithrombin III

**Therapeutic outcome:** Prevention of thrombi

**USES:** Prevention and treatment of MI, open heart surgery, disseminated intravascular clotting syndrome, atrial fibrillation with embolization; as an anticoagulant in transfusion and dialysis

procedures; to maintain patency of indwelling venipuncture devices; diagnosis, treatment of disseminated intravascular coagulation (DIC)

## CONTRAINDICATIONS

Bleeding, hypersensitivity to this product, corn, porcine protein (pork product)

**Precautions:** Pregnancy **C,** children, geriatric, alcoholism, hyperlipidemia, diabetes, renal disease, heparin-induced thrombocytopenia (HIT), hemophilia, leukemia with bleeding, peptic ulcer disease, severe thrombocytopenic purpura, renal/hepatic disease (severe), blood dyscrasias, severe hypertension, subacute bacterial endocarditis, acute nephritis; benzyl alcohol products in neonates, infants, pregnancy, lactation

## DOSAGE AND ROUTES

### For the treatment of deep venous thrombosis (DVT) or pulmonary embolism; for the treatment of arterial thromboembolism, including cerebral thromboembolism; or for the treatment of mural thrombosis

**IV infusion dosage (weight based)**

**Adult:** 80 units/kg IV bolus, then maintenance infusion of 18 units/kg/hour IV continuous infusion. If the aPTT is less than 35 (1.2 times normal), increase infusion rate by 4 units/kg/hour and rebolus with 80 units/kg IV. If aPTT is 35 to 45 (1.2 to 1.5 times normal), increase infusion rate by 2 units/kg/hour and rebolus with 40 units/kg IV. If aPTT is 46 to 70 (1.5 to 2.3 times normal), maintain infusion. If aPTT is 71 to 90 (2.3 to 3 times normal), decrease infusion rate by 2 units/kg/hr. If aPTT is more than 90 (more than 3 times normal), hold infusion for 1 hr and decrease rate by 3 units/kg/hr. Repeat aPTT every 6 hr for the first 24 hr, then every morning, unless it is outside the therapeutic range. Patients should be treated for 5 days or more, and oral anticoagulation should be overlapped for 4 to 5 days or more. Heparin can be discontinued on day 5 to 6 if the INR has been within the therapeutic range for 2 consecutive days. Patients with massive PE or severe iliofemoral thrombosis should be offered a longer period of heparin therapy (about 10 days)

**Children and Adolescent:** 75 to 100 units/kg IV load then 20 units/kg/hr IV as an initial maintenance dose. Adjust dose to maintain aPTT 60 to 85 seconds, assuming this reflects an antifactor Xa level of 0.3 to 0.7 units/ml

**Neonate and infant:** 75 to 100 units/kg IV load then 28 units/kg/hr IV as an initial maintenance dose. Adjust dose to maintain aPTT 60 to 85 seconds, assuming this reflects an antifactor Xa level of 0.3 to 0.7 units/ml

**Intermittent IV dosage**

**Adult:** 5000 to 10,000 units IV every 4 to 6 hr or 100 units/kg IV every 4 hr. Dosage should be adjusted according to coagulation test results

**Infant, children, and adolescent:** Initially, 50 units/kg IV as a loading dose then 100 units/kg IV every 4 hr. Adjust dosage according to aPTT results. Continuous infusion is preferred over intermittent administration in pediatric patients

**SUBCUT dosage**

**Adult:** 8000 to 10,000 units SUBCUT every 8 hr or 15,000 to 20,000 units SUBCUT every 12 hr

### For the treatment of deep venous thrombosis (DVT) or pulmonary embolism; for the treatment of arterial thromboembolism, including cerebral thromboembolism; or for the treatment of mural thrombosis

**IV infusion dosage (weight based)**

**Adult:** 80 units/kg IV bolus, then maintenance infusion of 18 units/kg/hr IV continuous infusion. If the aPTT is less than 35 (1.2 times normal), increase infusion rate by 4 units/kg/hr and rebolus with 80 units/kg IV. If aPTT is 35 to 45 (1.2 to 1.5 times normal), increase infusion rate by 2 units/kg/hr and rebolus with 40 units/kg IV. If aPTT is 46 to 70 (1.5 to 2.3 times normal), maintain infusion. If aPTT is 71 to 90 (2.3 to 3 times normal), decrease infusion rate by 2 units/kg/hr. If aPTT is more than 90 (more than 3 times normal), hold infusion for 1 hr and decrease rate by 3 units/kg/hr. Repeat aPTT every 6 hr for the first 24 hr, then every morning, unless it is outside the therapeutic range. Patients should be treated for 5 days or more, and oral anticoagulation should be overlapped for 4 to 5 days or more. Heparin can be discontinued on day 5 to 6 if the INR has been within the therapeutic range for 2 consecutive days. Patients with massive PE or severe iliofemoral thrombosis should be offered a longer period of heparin therapy (about 10 days)

**Children and adolescent:** 75 to 100 units/kg IV load then 20 units/kg/hr IV as an initial maintenance dose. Adjust dose to maintain aPTT 60 to 85 sec, assuming this reflects an antifactor Xa level of 0.3 to 0.7 units/ml

**Neonate and infant:** 75 to 100 units/kg IV load then 28 units/kg/hr IV as an initial maintenance dose. Adjust dose to maintain aPTT 60 to 85 sec, assuming this reflects an antifactor Xa level of 0.3 to 0.7 units/ml

**Intermittent IV dosage**

**Adult:** 5000 to 10,000 units IV every 4 to 6 hr or 100 units/kg IV every 4 hr. Dosage should be adjusted according to coagulation test results

**Infant, children, and adolescent:** Initially, 50 units/kg IV as a loading dose then 100 units/kg IV every 4 hr. Adjust dosage according to aPTT results. Continuous infusion is preferred over intermittent administration in pediatric patients

**Subcutaneous dosage**

**Adult:** 8000 to 10,000 units SUBCUT every 8 hr or 15,000 to 20,000 units SUBCUT every 12 hr

### For thrombosis prophylaxis, including arterial thromboembolism prophylaxis, during extracorporeal circulation in patients undergoing open heart or other cardiovascular surgery

**IV dosage**

**Adult:** Initially, at least 150 units/kg IV. For procedures expected to last less than 60 min, doses up to 300 units/kg IV may be used. For procedures expected to last longer than 60 min, doses up to 400 units/kg IV may be used. Further dosage should be based on coagulation test results (e.g., activated clotting time [ACT])

### For thrombosis prophylaxis, including arterial thromboembolism prophylaxis, during hemodialysis

**IV dosage**

**Adult:** 2000 to 5000 units IV bolus at the initiation of dialysis, followed by 10 to 20 units/kg/hr IV infusion directly into the arterial port of the dialysis circuit or repeated bolus doses as needed to maintain the activated clotting time (ACT) or whole blood partial thromboplastin time (WBPTT) at about 150% of baseline. The extent of anticoagulation is based on risk factors for bleeding and coexisting conditions. In patients at moderate risk for bleeding, administration of lower loading doses and lower maintenance infusion rates can be used to maintain the ACT or WBPTT at about 115% to 125% of baseline

### For coronary artery thrombosis prophylaxis during percutaneous coronary intervention (PCI) in patients not receiving abciximab therapy

**IV dosage**

**Adult:** 60 to 100 units/kg IV bolus; maintain the activated clotting time (ACT) within 250 to 300 sec by the HemoTec device or 300 to 350 sec by the Hemochron device. Postprocedural heparin is not routinely given for uncomplicated PCI. Early femoral sheath removal is recommended (e.g., when the ACT falls to less than 150 to 180 sec) to reduce access site complications

### For coronary artery thrombosis prophylaxis during percutaneous coronary intervention (PCI) in patients receiving abciximab concomitantly

**IV dosage**

**Adult:** 50 to 70 units/kg IV bolus; maintain the activated clotting time (ACT) at 200 sec or more with either the HemoTec or Hemochron device. Remove femoral sheaths after the procedure when the ACT falls to less than 150 to 180 sec

### For thrombosis prophylaxis and/or pulmonary embolism prophylaxis in patients at increased risk after sustaining an acute MI (e.g., Q-wave infarction, severe LV dysfunction, HF, history of systemic or pulmonary embolism, 2D echo evidence of mural thrombus, or atrial fibrillation)

**IV or SUBCUT dosage**

Adults: In patients not receiving thrombolytic therapy, 75 units/kg IV bolus, followed by 1250 units/hr IV, with a target aPTT of 1.5 to 2 times control (also see dosage for treatment of an evolving acute MI). For patients who have received heparin after thrombolytic therapy (see acute myocardial infarction indication for initial heparin dosage recommendations after thrombolytic therapy), continue IV heparin or change to SUBCUT heparin (initial dose about 17,500 units every 12 hr) beyond 48 hr to maintain the aPTT 1.5 to 2 times control, LMWH, or convert to oral anticoagulation

**Available forms:** Sol for inj 10, 100, 1000, 2000, 5000, 7500, 10,000, 20,000, 40,000 units/ml; premixed 1000 units/500 ml, 2000 units/1000 ml, 12,500 units/250 ml, 25,000 units/250 ml, 25,000 units/500 ml; lock flush preparations 10 units/ml

### Implementation

- Heparin and low-molecular-weight heparins are not interchangeable
- Give at same time each day to maintain steady blood levels
- Store at room temperature

**SUBCUT route**

- Give SUBCUT with at least 25-G $^{3}/_{8}$-in needle; do not massage area or aspirate fluid when giving SUBCUT inj; give in abdomen between pelvic bones, rotate sites; leave in for 10 sec; apply gentle pressure for 1 min
- Changing needles is not recommended

**Heparin lock route**

- Do not mistake heparin sodium injection 10,000 units/ml and Hep-Lock U/P 10 units/ml; they have similar blue labeling; deaths

in pediatric patients have occurred when heparin sodium injection vials were confused with heparin flush vials

- Inject 10-100 units/0.5-1 ml after each inf or q8-12hr

**Direct IV route**

- Give loading dose undiluted over ≥1 min; use before continuous infusion

**IV route**

- Obtain baseline coagulation tests before use
- Use infusion pump, make sure pressure dressings are used after drawing blood
- Draw coagulation studies 30 min before next dose, never draw from tubing or from infused vein, use other

**Continuous IV infusion route**

- Dilute 25,000 units/250-500 ml 0.9% NaCl or $D_5W$ (50-100 units/ml); some solutions are premixed and ready for use
- When product is added to inf sol for cont **IV**, invert container at least 6 × to ensure adequate mixing
- **Flush:** Inject to prevent clots in heparin lock, inject dilute heparin solution (10-100 units) 0.5-1 ml after each injection of q8hr, flush lock before and after each use with sterile water or 0.9% NaCl

**Y-site compatibilities:** acetaminophen, acetylcysteine, acyclovir, Alcohol 10%, dextrose 5%, alemtuzumab, alfentanil, allopurinol, Amifostine, Aminocaproic acid, aminophylline, amphotericin B lipid complex, Amphotericin B liposome, anidulafungin, argatroban, Arsenic trioxide, ascorbic acid injection, asparaginase, atenolol, atropine, azaTHIOprine, azithromycin, Aztreonam, Benztropine, Betamethasone, Bivalirudin, bleomycin, Bretylium, bumetanide, buprenorphine, butorphanol, Caffeine, calcium chloride/gluconate, Cangrelor, CARBOplatin, carmustine, Cefamandole, ceFAZolin, Cefoperazone, cefotaxime, cefoTEtan, Cefotiam, cefOXitin, ceftaroline, cefTAZidime, ceftizoxime, Ceftobiprole, cefTRIAXone, cefuroxime, Cephapirin, chloramphenicol succinate, chlordiazePOXIDE, chlorothiazide, chlorpheniramine, cimetidine, CISplatin, Cladribine, clindamycin, Cloxacillin, codeine, Colistimethate, Cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, DAUNOrubicin citrate liposome, dexamethasone, Dexmedetomidine, Dexrazoxane, digoxin, DOCEtaxel, DOPamine, doripenem, Doxacurium, Doxapram, DOXOrubicin liposomal, Edetate calcium disodium, Edrophonium, enalaprilat, Ephedrine sulfate, EPINEPHrine, epoetin alfa, eptifibatide, Ergonovine, ertapenem, esmolol, estrogens conjugated, Ethacrynate, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, flecainide, fluconazole, Fludarabine, fluorouracil, folic acid (as sodium salt), foscarnet, Gallamine, Gallium, ganciclovir, gemcitabine, Gemtuzumab, Glycopyrrolate, granisetron, hydrocortisone, HYDROmorphone, ibuprofen lysine, ifosfamide, imipenem-cilastatin, indomethacin, irinotecan, Isoproterenol, ketorolac, Lactated Ringer's Injection, lansoprazole, leucovorin, lidocaine, Lincomycin, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, Mephentermine, meropenem, Mesna, Metaraminol, methadone, Methohexital, methotrexate, Methoxamine, Methyldopate, methylergonovine, metoclopramide, metoprolol, metroNIDAZOLE, micafungin, midazolam, milrinone, minocycline, mitoMYcin, Mivacurium, morphine, moxifloxacin, Multiple vitamins injection, nafcillin, Nalbuphine, Nalorphine, naloxone, neostigmine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PAClitaxel (solvent/surfactant), palonosetron, pamidronate, pancuronium, PEMEtrexed, penicillin G potassium/sodium, PENTobarbital, Phenobarbital, phentolamine, phenylephrine, phytonadione, piperacillin sodium, piperacillin-tazobactam, potassium acetate/chloride, procainamide, prochlorperazine, Promazine, propofol, propranolol, pyridostigmine, pyridoxine, ranitidine, remifentanil, Ringer's injection, riTUXimab, rocuronium, sargramostim, scopolamine, Sodium acetate/Bicarbonate/fusidate, succinylcholine, Sufentanil, tacrolimus, theophylline, thiamine, Thiopental, Thiotepa, Ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, Tolazoline, topotecan, TPN (2-in-1), Tranexamic acid, trastuzumab, Trimetaphan, trimethobenzamide, Tubocurarine, urokinase, vasopressin, vecuronium, verapamil, vinBLAstine, vinCRIStine, voriconazole, warfarin, zidovudine, zoledronic acid.

## ADVERSE EFFECTS

**CNS:** *Fever,* chills, headache
**GU:** Hematuria
**HEMA:** Hemorrhage, thrombocytopenia, anemia, heparin-induced thrombocytopenia (HIT)
**INTEG:** *Rash,* dermatitis, urticaria, pruritus, delayed transient alopecia, hematoma, cutaneous necrosis (SUBCUT), injection site reactions
**META:** Hyperlipidemia
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (SUBCUT) |
| **Distribution** | Unknown |
| **Metabolism** | Partially in kidney, liver |
| **Excretion** | Lymph, spleen, in urine (<50% unchanged) |
| **Half-life** | 1-2 hr (dose dependent) |

### Pharmacodynamics

| | SUBCUT | IV |
|---|---|---|
| **Onset** | ½-1 hr | 5 min |
| **Peak** | 2 hr | 10 min |
| **Duration** | 8-12 hr | 2-6 hr |

## INTERACTIONS

### Individual drugs

Dextran, dipyridamole, ticlopidine, clopidogrel, presgrel: increased action of heparin
Digoxin: decreased action of heparin
Nicotine: decreased action of heparin

### Drug classifications

Anticoagulants (oral), cephalosporins, NSAIDs, penicillins, platelet inhibitors, salicylates, antineoplastics, SSRIs, SNRIs: increased action of heparin, quinidine, valproic acid
Antihistamines, tetracyclines, cardiac glycosides: decreased action of heparin, nitroglycerin
Corticosteroids: decreased action of corticosteroids

### Drug/herb

Anise, arnica, chamomile, clove, dong quai, feverfew, garlic, ginger, ginkgo, green tea, horse chestnut: increased bleeding risk

### Drug/lab test

Increased: ALT, AST, INR, pro-time, PTT, potassium
Decreased: platelets

## NURSING CONSIDERATIONS

### Assessment

- **Thrombosis:** Monitor for increased thrombosis daily
- Assess for blood studies (Hct, occult blood in stools) q3mo if patient is on long-term therapy
- Monitor PPT, which should be 1½-2 × control, PTT; often done daily, APTT, ACT, PTT 1.5-2.5 × control
- Monitor platelet count q2-3day; thrombocytopenia may occur on fourth day of treatment and resolve, or continue to fifth to tenth day of treatment
- **Bleeding, hemorrhage:** Assess for bleeding gums, petechiae, ecchymosis, black tarry stools, hematuria, epistaxis, decrease in Hct, B/P; notify prescriber immediately; HIT may occur after product discontinuation, check periodically for sign of decreasing clots
- **Monitor for hypersensitivity:** fever, skin rash, urticaria; notify prescriber immediately
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, do not use products with benzyl alcohol in pregnancy, breastfeeding

### Patient/family education

- Advise patient to avoid OTC preparations that may cause serious product interactions unless directed by prescriber; may contain aspirin or other anticoagulants, notify all health care persons of heparin use
- Tell patient that product may be withheld during active bleeding (menstruation), depending on condition
- Caution patient to use soft-bristle toothbrush to avoid bleeding gums; avoid contact sports; use electric razor; avoid IM inj
- Instruct patient to carry/wear emergency ID or other identification identifying product taken and condition treated
- **Advise patient to report any signs of bleeding:** gums, under skin, urine, stools; or unusual bruising even after discontinuing product

### Evaluation

**Positive therapeutic outcome**

- Prevention of new clots
- PTT of 1.5-2.5 × control
- Free-flowing **IV**, DVT and pulmonary emboli

## TREATMENT OF OVERDOSE:

Withdraw product, give protamine sulfate 1 mg protamine/100 units heparin

## homatropine ophthalmic

*See Appendix B*

## hydrALAZINE (Rx)

(hye-dral′a-zeen)
**Apresoline**
*Func. class.:* Antihypertensive, direct-acting peripheral vasodilator
*Chem. class.:* Phthalazine

**Do not confuse:** hydrALAZINE/ hydrOXYzine

**ACTION:** Vasodilates arterioles in smooth muscle by direct relaxation; reduces B/P with reflex increases in heart rate, stroke volume, cardiac output

**Therapeutic outcome:** Decreased B/P in hypertension, decreased afterload in HF

**USES:** Essential hypertension, hypertensive emergency/urgency, preeclampsia

**Unlabeled uses:** Heart failure not responsive to cardiac glycosides and diuretics

## CONTRAINDICATIONS

Hypersensitivity to hydrALAZINEs, mitral valvular rheumatic heart disease, CAD

**Precautions:** Pregnancy, breastfeeding, geriatric, CVA, advanced renal disease, liver disease, SLE, dissecting aortic aneurysm

## DOSAGE AND ROUTES

### Hypertension

**Adult:** PO 10 mg qid 2-4 days, then 25 mg qid for rest of 1st wk, then 50 mg qid individualized to desired response; max 300 mg/day
**Child:** PO 0.75-1 mg/kg/day in 2-4 divided doses; max 25 mg/dose, increase over 3-4 wk to max 7.5 mg/kg/day or 200 mg, whichever is less

### Hypertensive crisis

**Adult:** **IV** BOL 10-20 mg q4-6hr; administer PO as soon as possible; IM 10-50 mg q4-6hr
**Child:** **IV** BOL 0.1-0.6 mg/kg q4hr; IM 0.1-0.6 mg/kg q4-6hr, max 1.7-3.5 mg/kg/day

### HF (unlabeled)

**Adult:** PO 10-25 mg bid, max 75 mg tid

**Available forms:** Inj 20 mg/ml; tabs 10, 25, 50, 100 mg

### Implementation

**PO route**
- Give with meals to enhance absorption
- Store protected from light and heat

**IM route**
- Do not admix; switch to PO as soon as possible

**Direct IV route**
- Give by **IV** undiluted through Y-tube or 3-way stopcock, give each 10 mg over 1 min or more
- Administer with patient in recumbent position; keep in that position for 1 hr after administration

**Y-site compatibilities:** Heparin, hydrocortisone, potassium chloride, verapamil, vit B/C

**Y-site incompatibilities:** Aminophylline, ampicillin, diazoxide, furosemide, PACLitaxel

## ADVERSE EFFECTS

**CNS:** *Headache, tremors, dizziness, anxiety,* peripheral neuritis, depression, fever, chills
**CV:** *Palpitations, reflex tachycardia, angina,* shock, rebound hypertension, orthostatic hypotension
**GI:** *Nausea, vomiting, anorexia, diarrhea,* constipation, paralytic ileus, hepatotoxicity
**GU:** Urinary retention, glomerulonephritis, hematuria
**HEMA:** Leukopenia, agranulocytosis, anemia, thrombocytopenia
**INTEG:** Rash, pruritus, urticaria
**MISC:** Nasal congestion, muscle cramps, *lupuslike symptoms,* flushing, edema, dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed (PO); well absorbed (IM); completely absorbed (**IV**) |
| **Distribution** | Widely distributed; crosses placenta, protein binding 89% |
| **Metabolism** | GI mucosa, liver extensively [illegible]; half of Mexicans, Blacks, South Indians, and Caucasians are at risk for toxicity |
| **Excretion** | Kidneys, urine (12%-14%) |
| **Half-life** | 3-7 hr |

### Pharmacodynamics

| | PO | IM | IV |
|---|---|---|---|
| **Onset** | ½ hr | 10-30 min | 5-20 min |
| **Peak** | 1-2 hr | 1 hr | 10-80 min |
| **Duration** | 6-12 hr | 2-6 hr | Up to 12 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased hypotension
Indomethacin: decreased effects of hydrALAZINE

### Drug classifications

β-Adrenergic blockers: metoprolol, propranolol; increased effects
MAOIs: severe hypotension
Other antihypertensives, thiazide diuretics: increased hypotension
Sympathomimetics (EPINEPHrine, norepinephrine): increased tachycardia, angina
NSAIDs, estrogens: decreased hydrALAZINE effects

### Drug/Food

Increase: drug absorption; have patient take with food

## NURSING CONSIDERATIONS

### Assessment

- **Assess cardiac status:** B/P q5min for 2 hr, then qhr for 2 hr, then q4hr; pulse, jugular venous distention q4hr decreased after level
- Monitor electrolytes, blood studies: potassium, sodium, chloride, carbon dioxide, CBC,

serum glucose; LE prep, ANA titer before starting treatment
• Monitor weight daily, I&O; check for edema in feet, legs daily; check skin turgor, dryness of mucous membranes for hydration status
• Assess for crackles, dyspnea, orthopnea; peripheral edema, fatigue, weight gain, jugular vein distention (HF)
• For fever, joint pain, rash, sore throat (lupus-like symptoms), notify prescriber, number of refills to determine compliance
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, third-trimester toxicity has occurred, cautious use in breastfeeding
• **Beers:** Use with caution in older adults, may exacerbate syncope in those with a history of syncope

### Patient/family education
• Teach patient to take with food to increase bioavailability (PO)
• Teach patient to avoid OTC preparations unless directed by prescriber
• Advise patient to notify prescriber if chest pain, severe fatigue, fever, muscle or joint pain occur
• Advise patient to rise slowly to prevent orthostatic hypertension
• Advise patient to notify prescriber if pregnancy is suspected
• Advise patient that follow up will be needed, to comply with other requirements such as exercise, weight loss, avoiding smoking

### Evaluation
**Positive therapeutic outcome**
• Decreased B/P, decreased afterload in hypertension

## TREATMENT OF OVERDOSE:
Administer vasopressors, volume expanders for shock; if PO, lavage

## hydrochlorothiazide (Rx)
(hye-droe-klor-oh-thye'a-zide)
**Apo-Hydrol** 🍁**, Microzide, Neo-Codema** 🍁**, Oretic, Urozide** 🍁
*Func. class.:* Diuretic, antihypertensive
*Chem. class.:* Thiazide, sulfonamide derivative

**ACTION:** Acts on the distal tubule in the kidney, increasing excretion of sodium, water, chloride, and potassium

**Therapeutic outcome:** Decreased B/P, decreased edema in lung tissues peripherally

**USES:** Edema, hypertension, diuresis, HF; idiopathic lower extremity edema therapy

## CONTRAINDICATIONS
Hypersensitivity to thiazides or sulfonamides, anuria, renal decompensation, pregnancy (D) preeclampsia

**Precautions:** Pregnancy, breastfeeding, hypokalemia, renal/hepatic disease, gout, COPD, lupus erythematosus, diabetes mellitus, hyperlipidemia, CCr <30 ml/min, hypomagnesemia

## DOSAGE AND ROUTES
### Hypertension
**Adult/adolescent:** PO 12.5-25 mg/day, may increase to 50 mg/day in 1-2 divided doses, max 100 mg/day
**Child >6 mo:** PO 1-2 mg/kg/day in divided doses; max 37.5 mg/day for 6 mo-2 yr; max 37.5 mg/day
**Child <6 mo:** PO up to 2-3.3 mg/kg/day in divided doses
**Geriatric:** PO 12.5 mg qday

### Renal dose
**Adult:** PO CCr <30 ml/min, do not use, not effective

**Available forms:** Tabs 12.5, 25, 50, 100 🍁 mg; caps 12.5 mg

### Implementation
**PO route**
• Give in AM to avoid interference with sleep
• Provide potassium replacement if potassium level is ≤3.0 mg/dl; give whole tab or use oral sol lightly; product may be crushed if patient is unable to swallow, replace magnesium if needed
• Administer with food; if nausea occurs, absorption may be increased

## ADVERSE EFFECTS
**CNS:** Drowsiness, paresthesia, depression, headache, *dizziness, fatigue, weakness,* fever
**CV:** Irregular pulse, *orthostatic hypotension,* palpitations, volume depletion, allergic myocarditis
**EENT:** Blurred vision
**ELECT:** *Hypokalemia,* hypercalcemia, hyponatremia, hypochloremia, hypomagnesemia
**GI:** *Nausea, vomiting, anorexia,* constipation, diarrhea, cramps, pancreatitis, GI irritation, hepatitis
**GU:** *Frequency,* polyuria, uremia, glucosuria, hyperuricemia, jaundice, erectile dysfunction
**HEMA:** Aplastic anemia, hemolytic anemia, leukopenia, agranulocytosis, thrombocytopenia, neutropenia
**INTEG:** *Rash,* urticaria, purpura, photosensitivity, alopecia, erythema multiforme
**META:** *Hyperglycemia, hyperuricemia,* renal failure, increased creatinine, BUN
**SYST:** Stevens-Johnson syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Variable |
| **Distribution** | Extracellular spaces; crosses placenta |
| **Metabolism** | Excreted unchanged in urine |
| **Excretion** | Breast milk |
| **Half-life** | 6-15 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 2 hr |
| **Peak** | 4 hr |
| **Duration** | 6-12 hr |

## INTERACTIONS

### Individual drugs

Amphotericin B, piperacillin, ticarcillin: increased hypokalemia
Cholestyramine, colestipol: decreased absorption of hydrochlorothiazide
Diazoxide: increased hyperglycemia, hyperuricemia, hypotension
Lithium: increased toxicity

### Drug classifications

Antidiabetics: decreased effect of antidiabetic agent
Cardiac glycosides, nondepolarizing skeletal muscle relaxants: increased toxicity
Diuretics (loop): increased effects of diuretic
Corticosteroids: increased hypokalemia
NSAIDs: decreased thiazide effect

### Drug/food

Licorice: increased severe hypokalemia

### Drug/lab test

Increased: parathyroid test, uric acid, calcium, glucose, cholesterol, triglycerides
Decreased: potassium, sodium, Hgb, WBC, platelets

## NURSING CONSIDERATIONS

### Assessment

- Monitor glucose in urine if patient is diabetic
- Assess improvement in CVP q8hr
- Check for rashes, temp elevation daily
- Assess for confusion, especially in geriatric patients; take safety precautions if needed
- Monitor for acidic urine, reduced urine, osmolality, nocturia; hypotension, broad T-wave, U-wave, ectopy, tachycardia, weak pulse; muscle weakness, altered LOC, drowsiness, apathy, lethargy, confusion, depression; anorexia, nausea, cramps, constipation, distention, paralytic ileus; hypoventilation, respiratory muscle weakness
- **Beers:** Use with caution in older adults, may exacerbate or cause syndrome of inappropriate antidiuretic hormone secretion or hyponatremia
- Assess fluid volume status: I&O ratios, electrolytes baseline and periodically record, count, or weigh diapers as appropriate; weight; distended red veins; crackles in lungs; color, quality, and specific gravity of urine; skin turgor; adequacy of pulses; moist mucous membranes; bilateral lung sounds; peripheral pitting edema; assess for dehydration: symptoms of decreasing output, thirst, hypotension; dry mouth and mucous membranes should be reported
- Monitor electrolytes: potassium, sodium, calcium, magnesium; also include BUN, blood pH, ABGs, uric acid, CBC, blood glucose, renal function
- Assess **hypertension** B/P before, during therapy with patient lying, standing, and sitting as appropriate; orthostatic hypotension can occur rapidly
- **Hypersensitivity to sulfonamides:** rash, discontinue; fatal Stevens-Johnson syndrome may occur, if skin rash occurs discontinue product
- Pregnancy, breastfeeding: May affect fetus, crosses placenta barrier, do not breastfeed

### Patient/family education

- Teach patient to take the medication early in the day at same time of day to prevent nocturia
- Instruct patient to take with food or milk if GI symptoms of nausea and anorexia occur
- Teach patient to maintain a weekly record of weight and notify prescriber of weight loss >5 lb
- Caution patient that this product causes a loss of potassium and that food rich in potassium should be added to the diet; refer to a dietitian for assistance in planning
- Caution patient to rise slowly from sitting or reclining positions, not to exercise in hot weather or stand for prolonged periods since orthostatic hypotension will be enhanced; lie down if dizziness occurs to prevent postural hypotension
- Teach patient not to use alcohol or any OTC medications without prescriber's approval; serious product reactions may occur
- Emphasize the need to contact prescriber immediately if muscle cramps, weakness, nausea, dizziness, or numbness occurs; rash
- Teach patient to take own B/P and pulse and record findings
- Teach patient to continue taking medication even if feeling better; this product controls symptoms but does not cure the condition
- Advise patient with hypertension to continue other medical treatment (exercise, weight loss, relaxation techniques, cessation of smoking)
- Teach patient to monitor weight and report changes to prescriber

- Discuss dietary potassium requirements
- Advise patient that follow-ups and routine lab tests will be required
- Teach patient how to take B/P, to continue with other medical regimens (weight loss, exercise)

### Evaluation

**Positive therapeutic outcome**

- Decreased edema
- Decreased B/P
- Increased diuresis

## TREATMENT OF OVERDOSE:

Lavage if taken orally, monitor electrolytes, administer dextrose in saline, monitor hydration, CV, renal status

**⚠ HIGH ALERT**

## HYDROcodone (Rx) REMS

(hye-droe-koe′done)

**Hycodan, Hysingla ER, Robidone, Zohydro ER**

## HYDROcodone/acetaminophen (Rx)

**Anexsia, NorCo**

## HYDROcodone/ibuprofen (Rx)

**Reprexain, Vicoprofen**

*Func. class.:* Antitussive opioid analgesic/nonopioid analgesic

**Controlled substance schedule II**

**Do not confuse:** HYDROcodone/hydrocortisone, oxyCODONE, Hycodan/Vicodin, Reprexain/ZyPREXA

## ACTION:

Acts directly on cough center in medulla to suppress cough; binds to opiate receptors in the CNS to reduce pain

**Therapeutic outcome:** Pain relief, decreased cough, decreased diarrhea

## USES:

Moderate/severe pain

## CONTRAINDICATIONS

Abrupt discontinuation, hypersensitivity to this product or benzyl, GI obstruction, status asthmaticus

**BLACK BOX WARNING:** Respiratory depression

**Precautions:** Pregnancy, breastfeeding, neonates, addictive personality, increased ICP, MI (acute), severe heart disease, respiratory, renal/hepatic disease, bowel impaction, urinary retention, viral infection, ulcerative colitis, seizures, sulfite hypersensitivity, psychosis, hypertension, hyperthyroidism

**BLACK BOX WARNING: Accidental exposure:** Neonatal opioid withdrawal syndrome, potential for overdose or poisoning, substance abuse, ethanol ingestion

## DOSAGES AND ROUTES

### HYDROcodone:

Extended release (Zohydro ER) 10, 15, 20, 30, 40, 50 mg; (Hysingla ER) 20, 30, 40, 60, 80, 100, 120 mg; syrup: 1 mg/ml

### For the treatment of chronic, severe pain in patients who require daily, around-the-clock, long-term opioid treatment

NOTE: Extended-release HYDROcodone should be reserved for patients in whom alternative treatment options (e.g., nonopioid analgesics or immediate-release opioids) are ineffective, not tolerated, or would be otherwise inadequate to provide sufficient management of pain. Discontinue all other around-the-clock opioid drugs upon initiation of HYDROcodone extended-release

NOTE: Single doses of HYDROcodone extended-release capsules >40 mg or a total daily dose >80 mg are for use in opioid-tolerant patients only. Daily doses of HYDROcodone extended-release tablets ≥ 80 mg are for use in opioid-tolerant patients only. Opioid-tolerant patients are defined as those taking, for a minimum of 1 wk, ≥ 60 mg oral morphine per day, ≥ 30 mg oral oxycodone per day, ≥ 8 mg oral hydromorphone per day, ≥ 25 mg oral oxymorphone per day, ≥ 25 mcg transdermal fentaNYL per hour, or an equivalent dose of another opioid

### For use as the first opioid analgesic or in patients who are not opioid tolerant (Zohydro ER Capsule ONLY)

**Adult:** 10 mg PO every 12 hr. Titrate dose by 10 mg every 12 hr as appropriate every 3-7 days

### For conversion from fentaNYL transdermal patch (Zohydro ER Capsule ONLY)

**Adult:** 10 mg PO every 12 hr for each 25 mcg/hr fentaNYL transdermal patch beginning 18 hr after removal of the fentaNYL patch. Titrate dose by 10 mg every 12 hr as appropriate every 3-7 days as needed

### For conversion from other oral opioid analgesics (Zohydro ER Capsule ONLY)

**Adult:** Calculate the total daily dose(s) of the prior opioid(s), then using conversion factor, determine total daily extended-release HYDROcodone dose. If regimen includes more than one opioid, sum converted totals. Divide the 24-hr HYDROcodone requirements into two equal doses given PO every 12 hr. Always round the dose down, if necessary, to the appropriate available strength of HYDROcodone extended-release capsules. Titrate dose by 10 mg every 12 hr as appropriate every 3-7 days. Use extreme caution when converting patients from methadone, as the ratio between methadone and other opioid agonists can vary widely

### For use as the first opioid analgesic or in patients who are not opioid tolerant (Hysingla ER Tablet ONLY)

**Adult:** 20 mg PO every 24 hr. Titrate dose by 10-20 mg as appropriate every 3-5 days

### For conversion from fentaNYL transdermal patch (Hysingla ER Tablet ONLY)

**Adult:** 20 mg PO every 24 hr for each 25 mcg/hr fentaNYL transdermal patch beginning 18 hr after removal of the fentaNYL patch. Titrate dose by 10-20 mg as appropriate every 3-5 days

### For conversion from buprenorphine transdermal patch (Hysingla ER Tablet ONLY)

**Adult:** 20 mg PO every 24 hr. Titrate dose by 10-20 mg as appropriate every 3-5 days

### For conversion from other oral opioid analgesics (Hysingla ER Tablet ONLY)

**Adult:** Calculate the total daily dose(s) of the prior opioid(s), then using conversion factor, determine total daily extended-release HYDROcodone dose. If regimen includes more than one opioid, sum converted totals. Reduce the calculated daily oral HYDROcodone dose by 25% and give the dose PO every 24 hr. Always round the dose down, if necessary, to the appropriate available strength of HYDROcodone extended-release tablets. Titrate dose by 10-20 mg as appropriate every 3-5 days. Use extreme caution when converting patients from methadone, as the ratio between methadone and other opioid agonists can vary widely

### Maximum dosage limits

**Adult:** Zohydro ER and Hysingla ER: There is no maximum dose of HYDROcodone; however, careful titration of HYDROcodone, especially in opioid-naive patients, is required until tolerance develops to some of the side effects (i.e., drowsiness and respiratory depression). Individualize dosage carefully

### Vantrela ER: Do not exceed a dose of 180 mg/day PO because of a potential risk of QT prolongation

**Geriatric:** Zohydro ER and Hysingla ER: There is no maximum dose of HYDROcodone; however, careful titration of HYDROcodone, especially in opioid-naive patients, is required until tolerance develops to some of the side effects (i.e., drowsiness and respiratory depression). Individualize dosage carefully

### Vantrela ER: Do not exceed a dose of 180 mg/day PO because of a potential risk of QT prolongation

**Adolescent:** Safety and efficacy have not been established

**Children:** Safety and efficacy have not been established

**Infant:** Safety and efficacy have not been established

**Neonate:** Safety and efficacy have not been established

### Patients with hepatic impairment dosing

*Mild or moderate hepatic impairment:* Monitor closely for respiratory depression and sedation

Zohydro ER and Hysingla ER: Use cautiously. No adjustment in starting dose is required

Vantrela ER: Initiate therapy with one half of the starting dose. Use alternative analgesics in patients who require doses less than 15 mg

*Severe hepatic impairment:* Monitor closely for respiratory depression and sedation

Zohydro ER: Initiate therapy at the lowest dose of 10 mg every 12 hr

Hysingla ER: Initiate therapy with one half of the starting dose

Vantrela ER: Use not recommended

### Patients with renal impairment dosing

*Mild renal impairment:* Monitor closely for respiratory depression and sedation

Zohydro ER: Initiate therapy with a low initial dose

Hysingla ER and Vantrela ER: No adjustment in starting dose is required

*Moderate to severe renal impairment, end-stage renal disease:* Monitor closely for respiratory depression and sedation

Zohydro ER: Initiate therapy with a low initial dose

Hysingla ER: Initiate therapy with one half of the starting dose
Vantrela ER: Initiate therapy with one half of the starting dose. Use alternative analgesics in patients who require doses less than 15 mg

## HYDROcodone/ibuprofen

### Oral dosage

**Adult and Adolescent 16 yr and older:** 1 tablet PO every 4 to 6 yr as needed. Lower the dose and/or increase the dosing frequency to determine the lowest effective drug exposure, especially in geriatric patients. Maximum dose is 5 tablets/day

**Available forms: HYDROcodone/acetaminophen:** 15 mg HYDROcodone/325 acetaminophen, 10 mg HYDROcodone/325 acetaminophen (Norco), **HYDROcodone/ibuprofen:** tabs 7.5 mg HYDROcodone/200 mg ibuprofen (Vico-profen), 2.5 mg HYDROcodone/200 mg ibuprofen, 5 mg HYDROcodone/ 200 mg ibuprofen, 10 mg HYDROcodone/200 mg ibuprofen

### Implementation

Check product carefully before using; fatalities have occurred by using wrong dose, wrong product

- Do not break, crush, or chew tabs; only scored tabs may be broken
- Give with antiemetic if nausea, vomiting occur
- Give when pain is beginning to return; determine dosage interval by patient response; continuous dosing of medication is more effective than given prn
- Medication should be slowly withdrawn after long-term use to prevent withdrawal symptoms

**BLACK BOX WARNING:** Max 4 g acetaminophen with combination product

- Store in light-resistant container at room temperature
- May be given with food or milk to lessen GI upset

**Extended release route**

- May need short- or rapid-acting opioid for breakthrough pain

## ADVERSE EFFECTS

**CNS:** *Drowsiness,* dizziness, light-headedness, confusion, headache, sedation, euphoria, dysphoria, weakness, hallucinations, disorientation, mood changes, dependence, seizures
**CV:** Palpitations, tachycardia, bradycardia, change in B/P, circulatory depression, syncope, cardiac arrest (child)
**EENT:** Tinnitus, blurred vision, miosis, diplopia
**GI:** *Nausea, vomiting, anorexia, constipation,* cramps, dry mouth, ulcers
**GU:** Increased urinary output, dysuria, urinary retention
**INTEG:** Rash, urticaria, flushing, pruritus
**RESP:** Respiratory depression, pulmonary edema, bronchopneumonia, respiratory arrest (child)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Unknown; crosses placenta |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys |
| **Half-life** | 3½-4½ hr |

### Pharmacodynamics

| | PO (analgesic) | PO (antitussive) |
|---|---|---|
| **Onset** | 10-20 min | Unknown |
| **Peak** | 30-60 min | Unknown |
| **Duration** | 4-6 hr | 4-6 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression

**BLACK BOX WARNING:** CYP3A4 inhibitors (erythromycin, ketoconazole, nefazodone, protease inhibitors): Increase HYDROcodone effect

### Drug classifications

Antidepressants (tricyclics), CNS depressants, general anesthetics, opioids, phenothiazines, sedative/hypnotics, skeletal muscle relaxants: increased CNS depression
MAOIs: increased severe reactions
Decrease: HYDROcodone effect CYP3A4 inducers

### Drug/herb

Lavender, valerian: increased CNS depression

### Drug/lab test

Increased: amylase, lipase

## NURSING CONSIDERATIONS

### Assessment

- **Assess pain:** intensity, type, location, duration, precipitating factor before and 1 hr after giving product, titrate upward by 25%; assess need for pain medication, physical dependency
- Monitor VS after parenteral route; note muscle rigidity; product history; liver; renal function tests; cough; and respiratory dysfunction: respiratory depression, character, rate, rhythm; notify prescriber if respirations are <10/min
- **Opioid addiction:** Identify opioid addiction or use before starting product, if product

has been used by snorting, fatal reactions have occurred
• **Monitor CNS changes:** dizziness, drowsiness, hallucinations, euphoria, LOC, pupil reaction
• Monitor allergic reactions: rash, urticaria

**BLACK BOX WARNING:** Neonatal opioid withdrawal syndrome: Monitor neonate for withdrawal (irritability, hyperactivity, abnormal sleep patterns, high-pitched crying, tremor, vomiting, diarrhea

• **Bowel status:** constipation; provide fluids, fiber in diet, may need stimulant laxative if opioid use exceeds 3 days

**BLACK BOX WARNING:** Respiratory depression: Do not use in those with respiratory depression; monitor for decreased respiratory rate, urge to breathe, sighing breathing pattern; carbon dioxide retention from respiratory depression may worsen sedation; an opioid antagonist may be needed

**BLACK BOX WARNING:** Ethanol ingestion: Warn patients use with ethanol can lead to serious overdose and death, do not use with other medications containing ethanol, unless directed by prescriber

**BLACK BOX WARNING:** Neonatal opioid withdrawal syndrome: Results from prolonged maternal use of long-acting opioids, can be fatal

• **Beers:** Avoid use in older adults, unless safer alternative is not available, may cause ataxia, impaired psychomotor function
• **Pregnancy/breastfeeding:** May affect fetus, crosses placental barrier, do not breastfeed

### Patient/family education
• Instruct patient to report any symptoms of CNS changes, allergic reactions; to avoid CNS depressants: alcohol, sedative/hypnotics for at least 24 hr after taking this product
• Teach patient that dizziness, drowsiness, and confusion are common and to avoid getting up without assistance, driving, or other hazardous activities
• Discuss in detail all aspects of the product

### Evaluation
**Positive therapeutic outcome**
• Decreased pain
• Decreased cough
• Teach patient to notify prescriber if pregnancy is planned or suspected
• Advise patient for dry mouth, use sugarless gum, frequent sips of water
• Advise patient to notify prescriber of relief of pain

**BLACK BOX WARNING:** Advise patient not to exceed 4000 mg in combination product with acetaminophen, check all other products that may contain acetaminophen

## TREATMENT OF OVERDOSE:
Naloxone HCl (Narcan) 0.2-0.8 **IV**, $O_2$, **IV** fluids, vasopressors

## hydrocortisone (Rx)
(hy-droh-kor'tih-sone)
**Cortef, Colocort, Cortena**
## hydrocortisone cypionate
**Cortef**
## hydrocortisone sodium succinate (Rx)
**A-hydroCort, Solu-Cortef**
*Func. class.:* Short-acting glucocorticoid
*Chem. class.:* Natural nonfluorinated, group IV potency (valerate), group VI potency (acetate and plain)

**Do not confuse:** hydrocortisone/HYDROcodone

**ACTION:** Decreases inflammation by suppressing migration of polymorphonuclear leukocytes and fibroblasts and reversing increased capillary permeability and lysosomal stabilization (systemic); antipruritic, antiinflammatory (topical)

**Therapeutic outcome:** Decreased inflammation

**USES:** Severe inflammation, septic shock, adrenal insufficiency, ulcerative colitis, collagen disorders, asthma, COPD, SLE, Stevens-Johnson syndrome, ulcerative colitis, TB

## CONTRAINDICATIONS
Hypersensitivity, fungal infections

**Precautions:** Pregnancy, breastfeeding, diabetes mellitus, glaucoma, osteoporosis, seizure disorders, ulcerative colitis, HF, myasthenia gravis, renal disease, esophagitis, peptic ulcer, metastatic carcinoma, septic shock, Cushing syndrome, hepatic disease, hypothyroidism, coagulopathy, thromboembolism, children <2 yr, psychosis, idiopathic thrombocytopenia (IM), acute glomerulonephritis, amebiasis, nonasthmatic bronchial disease, AIDS, TB, recent MI (associated with left-ventricular rupture)

## DOSAGE AND ROUTES

### Most disorders

**Adult:** PO 20-240 mg daily in divided doses; IM/**IV** 100-500 mg (succinate), may repeat q2-6hr, then 50-100 mg IM as needed

### Septic shock treatment

**Adult:** Cont IV 200 mg/day, taper when vasopressors are discontinued

### Adrenocortical insufficiency:

**Child:** PO 0.56 mg/kg/day (15-20 mg/m$^2$/day) as a single or divided dose; IM/IV 0.186-0.28 mg/kg/day (10-12 mg/m$^2$/day) in three divided doses
**Child:** PO 2-8 mg/kg/day (60-240 mg/m$^2$/day) as a single or divided dose; IM/IV 0.666-4 mg/kg (20-120 mg/m$^2$) q12-24hr

**Available forms: Hydrocortisone:** enema 100 mg/60 ml; tabs 5, 10, 20 mg; **acetate:** rectal suppository: 25, 30 mg: 10%; **cypionate:** tabs 5, 10, 20 mg; **succinate:** inj 100, 250, 500, 1000 mg vial

### Implementation

**PO route**

- Give with food or milk to decrease GI symptoms
- Do not use acetate or susp for IV, salts are not interchangeable

**Topical route**

- Apply only to affected areas; do not get in eyes
- Cleanse and dry area before applying medication, then cover with occlusive dressing (only if prescribed); seal to normal skin; change q12hr; systemic absorption may occur; use only on dermatoses; do not use on weeping, denuded, or infected area
- Use for a few days after area has cleared
- Store at room temperature

**Nasal route**

- Patient should clear nasal passages before administration; use decongestant if needed; shake inhaler, invert, tilt head backward, insert nozzle into nostril, away from septum; hold other nostril closed and depress activator, inhale through nose, exhale through mouth

**IM route**

- Give deeply in large muscle mass; rotate sites; avoid deltoid; use 21-gauge needle

**IV route**

- **Succinate: IV** in mix-o-vial or reconstitute 250 mg or less/2 ml bacteriostatic water for injection, mix gently; give direct IV over 1 min or more; may be further diluted in 100, 250, 500, or 1000 ml of $D_5W$, $D_5$/0.9% NaCl, 0.9% NaCl given over ordered rate

### Sodium succinate

**Y-site compatibilities:** Acetaminophen, acyclovir, alemtuzumab, alfentanil, allopurinol, amifostine, ampicillin, amphotericin B cholesteryl, inamrinone, amsacrine, atracurium, atropine, aztreonam, betamethasone, calcium gluconate, cefepime, cefmetazole, cephalothin, chlordiazePOXIDE, chlorproMAZINE, cisatracurium, cladribine, cyanocobalamin, cytarabine, dexamethasone, digoxin, diphenhydrAMINE, DOPamine, DOXOrubicin liposome, droperidol, edrophonium, enalaprilat, EPINEPHrine, esmolol, conjugated estrogens, ethacrynate, famotidine, fentaNYL, fentaNYL/droperidol, filgrastim, fludarabine, fluorouracil, foscarnet, furosemide, gallium, granisetron, heparin, hydrALAZINE, regular insulin, isoproterenol, kanamycin, lidocaine, LORazepam, magnesium sulfate, melphalan, menadiol, meperidine, methicillin, methoxamine, methylergonovine, minocycline, morphine, neostigmine, norepinephrine, ondansetron, oxacillin, oxytocin, PACLitaxel, pancuronium, penicillin G potassium, pentazocine, phytonadione, piperacillin/tazobactam, prednisoLONE, procainamide, prochlorperazine, propofol, propranolol, pyridostigmine, remifentanil, scopolamine, sodium bicarbonate, succinylcholine, tacrolimus, teniposide, theophylline, thiotepa, trimethaphan, trimethobenzamide, vecuronium, vinorelbine, zoledronic acid

**Y-site incompatibilities:** Diazepam, ergotamine tartrate, IDArubicin, phenytoin, sargramostim

## ADVERSE EFFECTS

**CNS:** Depression, flushing, sweating, headache, mood changes, pseudotumor cerebri, euphoria, insomnia, seizures
**CV:** Hypertension, circulatory collapse, thrombophlebitis, embolism, tachycardia, edema, heart failure
**EENT:** Fungal infections, increased intraocular pressure, blurred vision, cataracts, glaucoma
**GI:** Diarrhea, nausea, abdominal distention, GI hemorrhage, increased appetite, pancreatitis, vomiting
**HEMA:** Thrombocytopenia
**INTEG:** Acne, poor wound healing, ecchymosis, petechiae
**MISC:** Adrenal insufficiency (after stress/withdrawal)
**MS:** Fractures, osteoporosis, weakness

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO); systemic (topical) |
| **Distribution** | Crosses placenta |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidney |
| **Half-life** | 3-5 hr, adrenal suppression 3-4 days |

### Pharmacodynamics

| | PO | IM | IV | TOPICAL |
|---|---|---|---|---|
| **Onset** | 1-2 hr | 20 min | Rapid | Min to hr |
| **Peak** | 1 hr | 4-8 hr | 1-2 hr | Hr to days |
| **Duration** | 1½ days | 1½ days | 1½ days | Hr to days |

## INTERACTIONS

### Individual drugs

Alcohol, amphotericin B, cycloSPORINE, digoxin: increased side effects

Bosentan, carBAMazepine, cholestyramine, colestipol, ePHEDrine, phenytoin, rifampin, theophylline: decreased action of hydrocortisone

### Drug classifications

Acetaminophen, NSAIDs, salicylates: increased risk of GI bleeding

Anticoagulants, calcium supplements, toxoids, vaccines: decreased action of each specific drug

Anticonvulsants: decreased effects of anticonvulsant

Antidiabetics: decreased effects of antidiabetics

Barbiturates: decreased action of hydrocortisone

Diuretics: increased side effects

Live virus vaccines/toxoids: increased neurologic reactions

### Drug/herb

Ephedra: decreased hydrocortisone levels

### Drug/lab test

Increased: cholesterol, sodium, blood glucose, uric acid, calcium, urine glucose

Decreased: calcium, potassium, $T_4$, $T_3$, thyroid $^{131}I$ uptake test, urine 17-OHCS, 17-KS

False negative: skin allergy tests

## NURSING CONSIDERATIONS

### Assessment

- **Adrenal insufficiency (cushingoid symptoms):** nausea, anorexia, shortness of breath, moon face, fatigue, dizziness, weakness, joint pain before and during treatment; monitor plasma cortisol levels during long-term therapy (normal level is 138-635 nmol/L when obtained at 8 AM); check adrenal function periodically for hypothalamic-pituitary-adrenal axis suppression
- Monitor potassium, blood glucose, urine glucose while patient is on long-term therapy; hypokalemia and hyperglycemia may occur
- Monitor I&O ratio; be alert for decreasing urinary output and increasing edema; weigh daily; notify prescriber of weekly gain >5 lb or edema, hypertension, cardiac symptoms
- **Beers:** Avoid in older adults with or at high risk for delirium
- **Assess for infection:** increased temp, WBC even after withdrawal of medication; product masks infection symptoms; if fever develops, product should be discontinued
- Check for potassium depletion: paresthesias, fatigue, nausea, vomiting, depression, polyuria, dysrhythmias, weakness
- Assess mental status: affect, mood, behavioral changes, aggression
- Check nasal passages during long-term treatment for changes in mucus (nasal)
- Assess for systemic absorption: increased temp, inflammation, irritation (topical)
- GI effects: nausea, vomiting, anorexia or appetite stimulation, diarrhea, constipation, abdominal pain, hiccups, gastritis, pancreatitis, GI bleeding/perforation with long-term treatment

### Patient/family education

- Teach patient all aspects of product use, including cushingoid symptoms
- Advise patient to carry/wear emergency ID as corticosteroid user; not to discontinue abruptly; adrenal crisis can result
- Instruct patient to notify prescriber if therapeutic response decreases; dosage adjustment may be needed
- Instruct patient to notify prescriber of signs of infection
- Teach patient that product can mask infections and cause hyperglycemia (diabetic)
- Teach patient to avoid live-virus vaccines if using steroids long term
- Teach patient not to discontinue abruptly, adrenal crisis can result; product should be tapered
- Caution patient to avoid OTC products unless directed by prescriber: salicylates, alcohol in cough products, cold preparations
- **Teach patient symptoms of adrenal insufficiency:** nausea, anorexia, fatigue, dizziness, dyspnea, weakness, joint pain; and when to notify prescriber
- Advise patient that long-term therapy may be needed to resolve infection (1-2 mo depending on type of infection)
- Teach patient to report immediately abdominal pain, black tarry stools, as GI bleeding/perforation can occur; if received by epidural route, report immediately change in vision, severe headache, seizures, weakness (emergency response needed)
- Advise patient not to discontinue abruptly or adrenal crisis can result; product should be tapered

**Nasal route**

- Instruct patient to clear nasal passages if sneezing attack occurs, then repeat dose; to continue using product even if mild nasal bleeding occurs; bleeding is usually transient

• Teach method of instillation after providing written instruction from manufacturer on instillation
• **Epidural use:** Assess for vision changes, seizures, stroke, paralysis, brain edema and death may occur (rare)

### Evaluation

**Positive therapeutic outcome**
• Decrease in runny nose (nasal)
• Decreased inflammation
• Absence of severe itching, patches on skin, flaking (top)
• Decreased GI symptoms

## hydrocortisone topical

*See Appendix B*

**⚠ HIGH ALERT**

## HYDROmorphone (Rx) REMS

(hye-droe-mor'fone)
**Dilaudid, Dilaudid-HP, Exalgo, Hydromorph Contin, Jurnista**
*Func. class.:* Antitussive, opioid analgesic agonist
*Chem. class.:* Phenanthrene derivative, guaifenesin
**Controlled substance schedule II**

**Do not confuse:** HYDROmorphone/meperidine/morphine, Dilaudid/Demerol

**ACTION:** Inhibits ascending pain pathways in CNS, increases pain threshold, alters pain perception

**Therapeutic outcome:** Decreased cough, decreased pain

**USES:** As an antitussive to suppress cough; moderate to severe pain

## CONTRAINDICATIONS

Hypersensitivity to this product, sulfite, COPD, cor pulmonale, emphysema, GI obstruction, ileus, increased intracranial pressure, obstetric delivery, status asthmaticus

**BLACK BOX WARNING:** Respiratory depression, opioid-naive patients

**Precautions:** Pregnancy, breastfeeding, children <18 yr, increased ICP, addictive personality, renal/hepatic disease, MI (acute), abrupt discontinuation, adrenal insufficiency, angina, asthma, biliary tract disease, bladder obstruction, hypothyroidism, hypovolemia, hypoxemia, IBD, IV use, labor, latex hypersensitivity, myxedema, seizure disorders, sleep apnea

**BLACK BOX WARNING:** Substance abuse, accidental exposure, potential for overdose/poisoning, neonatal opioid withdrawal syndrome

## DOSAGE AND ROUTES

**Available forms:** Powder of injection 250 mg; inj 1, 2, 4, 10 mg/ml; tabs 2, 4, 8 mg; oral sol 5 mg/5 ml; supp 3 mg, ext rel tab 8, 12, 16, 32 mg

### Implementation

• Give with antiemetic if nausea, vomiting occur
• Give when pain is beginning to return; determine dosage interval by patient response; continuous dosing of medication is more effective given prn; explain analgesic effect
• Withdraw medication slowly after long-term use to prevent withdrawal symptoms
• Store in light-resistant container at room temperature

**PO route**
• May be given with food or milk to lessen GI upset

### Extended release

**BLACK BOX WARNING:** Do not use extended-release products in opioid-naive patients or with other extended-release opioids, do not use with other extended-release HYDROmorphone products, may be fatal

• **Converting from oral opioids;** conversion ratios are approximate; initiate ext rel tabs at 50% of calculated total daily equivalent dose of ext rel, give q24hr; max increase q2-3days, consider titration increases of 25%-50% in each step
• **Converting from transdermal patch (fentaNYL)** initiate ext rel tabs 18 hr after removal of patch; for each 25 mcg/hr dose of transdermal fentaNYL the dose is 12 mg q24hr, start dose at 50% of calculated HYDROmorphone ext rel dose q24hr; titrate no more often than q3-4days, consider dose increases of 25%-50% with each step; if more than 2 rescue doses are required in 24 hr, consider titration

**SUBCUT route**
• Do not give if sol is cloudy or a precipitate has formed; rotate inj sites
• Use short 30-G needle, make sure not to inject intradermally

**Direct IV route**
• Give after diluting with 5 ml or more of sterile water or 0.9% NaCl for inj
• Give slowly at 2 mg over 3-5 min or less through Y-connector or 3-way stopcock

**IV infusion route**
• Dilute each 0.1-1 mg/ml in 0.9% NaCl, deliver by opioid syringe infusion; may be diluted in $D_5W$, $D_5$/NaCl, 0.45% NaCl or 0.9% NaCl for larger amounts and through an infusion pump

**Y-site compatibilities:** Acyclovir, allopurinol, amifostine, amikacin, amsacrine, aztreonam, cefamandole, cefepime, cefoperazone, cefotaxime, cefOXitin, cefTAZidime, ceftizoxime, cefuroxime, chloramphenicol, CISplatin, cladribine, clindamycin, cyclophosphamide, cytarabine, diltiazem, DOBUTamine, DOPamine, DOXOrubicin, doxycycline, EPINEPHrine, erythromycin lactobionate, famotidine, fentaNYL, filgrastim, fludarabine, foscarnet, furosemide, gentamicin, granisetron, heparin, kanamycin, labetalol, LORazepam, magnesium sulfate, melphalan, methotrexate, metroNIDAZOLE, midazolam, milrinone, morphine, nafcillin, niCARdipine, nitroglycerin, norepinephrine, ondansetron, oxacillin, PACLitaxel, penicillin G potassium, piperacillin, piperacillin/tazobactam, propofol, ranitidine, teniposide, thiotepa, ticarcillin, tobramycin, trimethoprim/sulfamethoxazole, vancomycin, vecuronium, vinorelbine

**Y-site incompatibilities:** Ampicillin, diazepam, minocycline, PHENobarbital, phenytoin, sargramostim

**Solution compatibilities:** $D_5W$, $D_5$/0.45% NaCl, $D_5$/0.9% NaCl, $D_5$/LR, $D_5$/Ringer's, 0.45% NaCl, 0.9% NaCl, Ringer's, LR

## ADVERSE EFFECTS

**CNS:** Dizziness, drowsiness, *sedation, confusion,* headache, euphoria, mood changes, seizures
**CV:** *Hypotension, bradycardia,* palpitations, change in B/P, tachycardia, peripheral vasodilation
**EENT:** Miosis, diplopia, blurred vision, tinnitus
**GI:** *Nausea, constipation, vomiting, anorexia,* dry mouth, cramps, paralytic ileus
**GU:** Increased urinary output, dysuria, urinary retention
**INTEG:** Urticaria, rash, flushing, bruising, diaphoresis, pruritus
**RESP:** Respiratory depression, dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO), complete (**IV**) |
| **Distribution** | Unknown; crosses placenta |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys |
| **Half-life** | Varied |

### Pharmacodynamics

| | PO/IM/SUBCUT | IV | RECT |
|---|---|---|---|
| **Onset** | 15-30 min | 10-15 min | 15-30 min |
| **Peak** | 30-60 min | 15-30 min | 30-90 min |
| **Duration** | 4-5 hr | 2-3 hr | 4-5 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased respiratory depression, hypotension, sedation

### Drug classifications

Antipsychotics, opiates, sedative/hypnotics, skeletal muscle relaxants: increased effects
MAOIs: increased severe reactions
Opiate antagonists: decreased HYDROmorphone effects

### Drug/herb

Chamomile, hops, kava, lavender, St. John's wort, valerian: increased action

### Drug/lab test

Increased: amylase

## NURSING CONSIDERATIONS

### Assessment

- **Assess pain control,** sedation by scoring on 0-10 scale; around-the-clock dosing is best for pain control
- Monitor VS after parenteral route; note muscle rigidity; product history

**BLACK BOX WARNING:** Respiratory dysfunction; respiratory depression; monitor character, rate, rhythm; notify prescriber if respirations are <10/min

**BLACK BOX WARNING:** Substance abuse: Assess for previous or current substance abuse, risk of abuse will be increased in these patients, assess for misuse of medication

- Monitor CNS changes: dizziness, drowsiness, hallucinations, euphoria, LOC, pupil reaction
- Monitor allergic reactions: rash, urticaria; bowel function, constipation
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, neonatal opioid withdrawal syndrome can occur if used for prolonged periods in pregnancy, do not use in breastfeeding, excretion unknown
- **Beers:** Avoid in older adults unless safer alternative is unavailable, may cause ataxia, impaired psychomotor function

### Patient/family education

**BLACK BOX WARNING:** Substance abuse: Instruct patient to report any symptoms of CNS changes, allergic reactions; to avoid CNS depressants: alcohol, sedative-hypnotics for at least 24 hr after taking this product

- Advise patient that dizziness, drowsiness, and confusion are common and to avoid getting up

without assistance, driving, or other hazardous activities
• Discuss in detail all aspects of the product, to take with food if nausea occurs

**BLACK BOX WARNING:** Teach patient that extended-release products must be taken whole, not to use with alcohol, medications with alcohol content

### Evaluation
**Positive therapeutic outcome**
• Decreased pain
• Decreased cough

## TREATMENT OF OVERDOSE:
Naloxone HCl (Narcan) 0.2-0.8 **IV**, $O_2$, **IV** fluids, vasopressors

## hydroxocobalmin
*See vitamin B-12 products*

## hydroxychloroquine (Rx)
(hye-drox-ee-klor'oh-kwin)
**Apo-Hydroxyquine** ✱, **Plaquenil**
*Func. class.:* Antimalarial, antirheumatic (DMARDs)
*Chem. class.:* 4-Aminoquinoline derivative

## ACTION:
Impairs complement-dependent antigen-antibody reactions

**Therapeutic outcome:** Resolution of infection

## USES:
Malaria caused by *Plasmodium vivax, P. malariae, P. ovale, P. falciparum* (some strains); LE, rheumatoid arthritis

## CONTRAINDICATIONS
Hypersensitivity to this product or chloroquine, retinal field changes

**Precautions:** Pregnancy, breastfeeding, blood dyscrasias, severe GI disease, neurologic disease, alcoholism, hepatic disease, G6PD deficiency, psoriasis, eczema, children, ocular disease

**BLACK BOX WARNING:** Requires an experienced clinician

## DOSAGE AND ROUTES
### Malaria
**Adult:** PO **suppression or prevention** 400 mg qwk, begin 2 wk before travel to endemic area, continue 4 wk after returning; **treatment** 800 mg, then 400 mg after 6-8 hr, then 400 mg/day on 2nd and 3rd day, total dose 2 g

**Child:** PO **suppression or prevention** 6.4 mg/kg (5 mg/kg base) qwk, begin 2 wk before travel to endemic area, continue 4 wk after returning; **treatment** 10 mg/kg, 6.4 mg/kg (5 mg/kg base), at 6, 24, 48 hr after 1st dose

### Lupus erythematosus
**Adult:** PO 400 mg (310 mg base) daily-bid; length depends on patient response; **maintenance** 200-400 mg/day

### Rheumatoid arthritis
**Adult:** PO 400 mg/day for 4-12 wk; then 200-400 mg/day after good response

**Available forms:** Tabs 200 mg

### Implementation
**PO route**

**BLACK BOX WARNING:** Only to be prescribed by experienced clinician

• Give before or after meals with milk, at same time each day to maintain product level
• Tabs may be crushed and mixed with food, fluids
• Malaria prophylaxis should be started 2 wk prior to exposure and 4-6 wk after leaving exposure area
• Store in tight, light-resistant container at room temperature; keep inj in cool environment

## ADVERSE EFFECTS
**CNS:** Headache, stimulation, fatigue, irritability, seizures, bad dreams, dizziness, confusion, psychosis, decreased reflexes
**CV:** Hypotension, heart block, asystole with syncope
**EENT:** *Blurred vision, corneal changes, retinal changes, difficulty focusing*, tinnitus, vertigo, deafness, photophobia, corneal edema
**GI:** *Nausea, vomiting, anorexia,* diarrhea, cramps
**HEMA:** Thrombocytopenia, agranulocytosis, leukopenia, aplastic anemia
**INTEG:** Pruritus, pigmentation changes, skin eruptions, lichen planus–like eruptions, eczema, exfoliative dermatitis, alopecia, Stevens-Johnson syndrome, photosensitivity

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed, crosses placenta |
| **Metabolism** | Liver |
| **Excretion** | Urine/feces |
| **Half-life** | 3-5 day |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | 1-2 hr |
| **Duration** | Days-weeks |

## INTERACTIONS

### Individual products

Magnesium, aluminum products: decreased malarial action
Digoxin: increased levels
Methotrexate: decreased levels
Rabies vaccine: increased antibody titer

### Drug classifications

Live-virus vaccines, botulinum toxoids: decreased effects

## NURSING CONSIDERATIONS

### Assessment

- **Assess for lupus erythematosus, malaria symptoms** before treatment and daily
- **Assess for rheumatoid arthritis:** pain, swelling, ROM, temp of joints, for decreased reflexes: knee, ankle
- Assess ophthalmic exam baseline, q6mo if long-term treatment or product dosage >150 mg/day
- Assess hepatic studies qwk: AST, ALT, bilirubin
- **Bone marrow suppression:** Assess blood studies: CBC, platelets; WBC, RBC, platelets may be decreased; if severe, product should be discontinued; malaise, fever, bruising, bleeding (rare)
- Assess for decreased reflexes: knee, ankle
- Assess ECG during therapy
- Assess for depression of T waves, widening of QRS complex
- **Assess allergic reactions:** pruritus, rash, urticaria
- **Assess for ototoxicity** (tinnitus, vertigo, change in hearing); audiometric testing should be done before, after treatment
- **Assess for toxicity:** blurring vision, difficulty focusing, headache, dizziness, knee, ankle reflexes; product should be discontinued immediately
- **Pregnancy/breastfeeding:** Increased rate of birth defects in the literature, CDC recommends this product for pregnant women with malaria or those with lupus, cautious use in breastfeeding

### Patient/family education

- Teach patient to use sunglasses in bright sunlight to decrease photophobia
- Teach patient that urine may turn rust or brown
- Teach patient to report hearing, vision problems; fever, fatigue, bruising, bleeding, which may indicate blood dyscrasias

### Evaluation

**Positive therapeutic outcome**

- Decreased symptoms of malaria, LE, rheumatoid arthritis

## TREATMENT OF OVERDOSE:

Induce vomiting; gastric lavage; administer barbiturate (ultra–short-acting), vasopressor, ammonium chloride; tracheostomy may be necessary

## hydrOXYzine (Rx)

(hye-drox′i-zeen)
**Atarax, Vistaril**
*Func. class.:* Antianxiety, sedative, hypnotic, antihistamine, antiemetic
*Chem. class.:* Piperazine derivative

**Do not confuse:** hydrOXYzine/hydrALAZINE, Vistaril/Versed

**ACTION:** Depresses subcortical levels of CNS, including limbic system, reticular formation; anticholinergic, antiemetic, antihistaminic responses; competes with $H_1$-receptor sites

**Therapeutic outcome:** Absence of allergy symptoms, rhinitis, pruritus, absence of nausea/vomiting, sedation, absence of anxiety

**USES:** Anxiety preoperatively; postoperatively to prevent nausea, vomiting; to potentiate opioid analgesics; sedation; pruritus; prevention of alcohol withdrawal

## CONTRAINDICATIONS

Pregnancy (1st trimester), breastfeeding, acute asthma, hypersensitivity to this product or cetirizine

**Precautions:** Pregnancy (2nd/3rd trimesters), geriatric, debilitated patients, renal/hepatic disease, closed-angle glaucoma, COPD, prostatic hypertrophy, asthma

## DOSAGE AND ROUTES

### Anxiety

**Adult:** PO 25-100 mg tid-qid, max 400 mg/day; IM 50-100 mg q4-6hr
**Child ≥6 yr:** PO 50-100 mg/day in divided doses, max 100 mg/day or 2 mg/kg/day
**Child <6 yr:** PO 50 mg/day in divided doses, max 50 mg/day or 2 mg/kg/day

### Alcohol withdrawal

**Adult:** IM 50-100 mg, then q4-6hr

### Preoperatively/postoperatively (nausea/vomiting)

**Adult:** IM 25-100 mg q4-6hr
**Child:** IM 0.5-1.1 mg/kg as a single dose

### Pruritus
**Adult:** PO 25 mg tid-qid; IM 50-100 mg, then q4-6hr prn, switch to PO as soon as feasible
**Child ≥6 yr:** PO 50-100 mg/day in divided doses; IM 0.5-1 mg/kg/dose q4-6hr prn, use PO when possible
**Child <6 yr: PO** 50 mg/day in divided doses

### Renal dose
**Adult:** PO CCr <50 ml/min reduce dose by 50%

**Available forms:** Tabs 10, 25, 50 mg; caps 25, 50, 100 mg; oral sol 10 mg/5 ml; oral susp 25 mg/5 ml; inj 25, 50 mg/ml

### Implementation
**PO route**
- Give without regard to meals
- May crush tab if patient is unable to swallow whole
- Caps may be opened and product mixed with food/fluids for patients with swallowing difficulties
- Shake oral susp before giving

**IM route**
- Give IM inj in large muscle mass; aspirate to prevent **IV** administration; use Z-track method; severe necrosis can result with improper technique; never give **IV**/SUBCUT (HCL)

**Syringe incompatibilities:** Aminophylline, chloramphenicol, dimenhyDRINATE, heparin, penicillin G potassium, PENTobarbital, PHENobarbital, phenytoin

## ADVERSE EFFECTS
**CNS:** *Dizziness, drowsiness,* confusion, headache, tremors, fatigue, depression, seizures
**CV:** Hypotension
**GI:** Dry mouth, nausea, diarrhea, increased appetite, weight gain

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Not known |
| **Metabolism** | Liver, completely |
| **Excretion** | Feces, urine, bile |
| **Half-life** | 3 hr |

### Pharmacodynamics

| | PO/IM |
|---|---|
| **Onset** | 15-60 min |
| **Peak** | 2-4 hr |
| **Duration** | 4-6 hr |

## INTERACTIONS
### Individual drugs
Alcohol: increased CNS depression
Atropine, disopyramide, haloperidol, quiNIDine: increased anticholinergic reactions

### Drug classifications
Analgesics, barbiturates, CNS depressants, opiates, sedative/hypnotics: increased CNS depression
Antidepressants, antihistamines, MAOIs, phenothiazines: increased anticholinergic reactions

### Drug/lab test
False negative: skin allergy testing
False increase: 17-hydroxycorticosteroids

## NURSING CONSIDERATIONS
### Assessment
- Anticholinergic effects: dry mouth, dizziness, confusion, hypotension, increased sedation; monitor B/P
- Assess respiratory status: rate, rhythm, increase in bronchial secretions, wheezing, chest tightness; provide fluids to 2 L/day to decrease secretion thickness
- Monitor I&O ratio: be alert for urinary retention, frequency, dysuria, especially in geriatric; product should be discontinued if these occur
- Observe for drowsiness, dizziness
- Assess cough characteristics including type, frequency, thickness of secretions; evaluate response to this medication if using for cough
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding
- **Beers:** Avoid use in older adults, anticholinergic effects, toxicity may occur

### Patient/family education
- Caution patient to avoid hazardous activities and activities requiring alertness, since dizziness may occur; instruct patient to request assistance with ambulation
- Advise patient to avoid alcohol, other CNS depressants including cough, cold preparations; CNS depression may occur
- Teach all aspects of product use; to notify prescriber if confusion, sedation, hypotension occur; to avoid driving and other hazardous activity if drowsiness occurs
- Caution patient not to exceed recommended dosage; dysrhythmias may occur
- Tell patient hard candy, gum, frequent rinsing of mouth may be used for dryness

### Evaluation
**Positive therapeutic outcome**
- Absence of nausea, vomiting
- Decreased anxiety

## TREATMENT OF OVERDOSE:
Lavage if orally ingested, VS, supportive care, **IV** norepinephrine for hypotension

## Hylan G-F 20
**Synvisc, Synvisc One**
*See Appendix A, Selected New Drugs*

halcinonide topical
haloperidol lactate (Rx)
hydrALAZINE (Rx)
HYDROcodone/acetaminophen (Rx)
hydrocortisone cypionate
HYDROmorphone (Rx) REMS
hydrOXYzine (Rx)
haloperidol (Rx)
heparin (Rx)
hydrochlorothiazide (Rx)
HYDROcodone/ibuprofen (Rx)
hydrocortisone sodium succinate (Rx)
hydroxocobalmin
Hylan G-F 20
haloperidol decanoate (Rx)
homatropine ophthalmic
HYDROcodone (Rx) REMS
hydrocortisone (Rx)
hydrocortisone topical
hydroxychloroquine (Rx)

## ibandronate (Rx)

(eye-ban′dro-nate)
**Boniva**
*Func. class.:* Bone-resorption inhibitor, electrolyte modifier
*Chem. class.:* Bisphosphonate

**ACTION:** Inhibits bone resorption, apparently without inhibiting bone formation and mineralization; absorbs calcium phosphate crystals in bone and may directly block dissolution of hydroxyapatite crystals of bone; more potent than other products

**Therapeutic outcome:** Increased bone mineral density

**USES:** Postmenopausal Osteoporosis and prophylaxis

**Unlabeled uses:** Hypercalcemia, osteolytic metastases, Paget's disease

## CONTRAINDICATIONS

Achalasia, esophageal stricture, hypocalcemia, intraarterial administration, renal failure, hypersensitivity to bisphosphonates, inability to stand or sit upright

**Precautions:** Pregnancy, breastfeeding, children, geriatric, anemia, chemotherapy, coagulopathy, dental disease, diabetes mellitus, dysphagia, GI/renal disease, GERD, hypertension, infection, multiple myeloma, phosphate hypersensitivity, vitamin D deficiency

## DOSAGE AND ROUTES

### Postmenopausal osteoporosis/ prophylaxis

**Adult:** PO 150 mg qmo; **IV** BOL 3 mg q3mo

### Paget's disease (unlabeled)

**Adult:** **IV** 2 mg as a single dose

### Bone metastases due to breast cancer (unlabeled)

**Adult:** **IV** 6 mg over 1 hr × 3 days, repeat q4wk

### Hypercalcemia of malignancy (unlabeled)

**Adult:** **IV** INF 2 mg over 15 min-2 hr q4wk, may give additional doses ≤6 mg (including first dose) if albumin-corrected serum calcium isn't normalized by day 4 after first dose

### Renal dose

**Adult:** PO CCr <30 ml/min, avoid use

**Available forms:** Tabs 2.5, 150 mg; sol for inj 3 mg/ml

### Implementation

**PO route**
- Give early AM with a glass of water; if qmo, give on same day of each month
- Patient to remain upright for ≥ 1 hr after taking
- Not to suck/chew, throat ulcers may occur
- Store at room temperature

**Direct IV route**
- Use single-dose prefilled syringe; discard unused portion; give over 15-30 sec
- Store at room temperature
- Do not use if discolored or if sol contains particulates

## ADVERSE EFFECTS

**CNS:** Fever, insomnia, dizziness, headache
**CV:** Hypertension, atrial fibrillation
**EENT:** Ocular pain/inflammation, uveitis, esophageal ulceration
**GI:** Constipation, nausea, vomiting, diarrhea, dyspepsia
**INTEG:** Rash, inj site reaction
**META:** *Hypomagnesemia, hypophosphatemia, hypocalcemia,* hypercholesterolemia
**MS:** Bone pain, myalgia, osteonecrosis of the jaw
**SYST:** Stevens-Johnson syndrome, erythema multiforme, dermatitis bullous

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Poor |
| **Distribution** | Taken up primarily by bones, 91%-99% protein binding |
| **Metabolism** | Unknown |
| **Excretion** | Primarily by kidneys (60%) |
| **Half-life** | 4.5-25.5 hr |

### Pharmacodynamics

| | PO |
|---|---|
| **Onset** | Unknown |
| **Peak** | 0.5-2 hr |
| **Duration** | Up to 1 mo |

## INTERACTIONS

### Individual drugs

Calcium, vitamin D, iron, aluminum, magnesium salts: decreased ibandronate effect, separate by 1 hr
Increased: GI irritation: NSAIDs, salicylates

### Drug classifications

Aminoglycosides, NSAIDs, radiopaque contrast agents: possible increased neurotoxicity
Loop diuretics: increased hypocalcemia

### Drug/food
• Do not take with food, calcium, give product on empty stomach

### Drug/lab test
Decreased: alk phos, magnesium, calcium, phosphate
Increased: cholesterol

## NURSING CONSIDERATIONS
### Assessment
• Osteoporosis: before and during treatment; monitor DEXA scan for bone mineral density, correct electrolyte imbalances (calcium, magnesium, phosphate) before starting therapy
• **Anaphylaxis:** swelling of face, lips, mouth, rash, sweating, wheezing, trouble breathing, discontinue immediately, provide supportive treatment
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk
• Assess for blood studies: electrolytes, Ca, P, Mg; creatinine/BUN
• Assess for atrial fibrillation
• Assess dental health; before dental extraction, may require drug holiday for up to 2 mo; osteonecrosis of the jaw may occur
• Assess for bone pain; use analgesics; may begin within 24 hr, or even years after treatment, pain usually subsides after treatment is discontinued
• Esophageal irritation/ulceration: Assess for heart burn, painful swallowing, avoid use in those with swallowing difficulties

### Patient/family education
• **Teach patient to report hypercalcemic relapse:** nausea, vomiting, bone pain, thirst; unusual muscle twitching, muscle spasms, severe diarrhea, constipation
• Advise patient to continue with dietary recommendations, including calcium and vit D, calcium, alk phosphatase
• Instruct patient to obtain an analgesic from provider for bone pain that may occur rapidly or within months
• Advise patient that if nausea/vomiting occur, small, frequent meals may help
• Teach patient to report vision symptoms: blurred vision, edema, inflammation; report to prescriber
• Teach to report if pregnancy is planned or suspected or if planning to breastfeed, pregnancy
• Encourage to exercise regularly, to stop smoking, and decrease alcohol
• Advise to take in AM at least 60 min before other meds, food, beverages, to take monthly dose on same day; if IV dose is missed reschedule as soon as able, reschedule subsequent doses on new time schedule, not to receive IV dose more than once in 3 mo
• Teach to sit upright ≥60 min after PO dose, to swallow tab whole, not to chew or suck, to prevent irritation

### Evaluation
**Positive therapeutic outcome**
• Increased bone mineral density

**⚠ HIGH ALERT**

# ibrutinib
(eye-broo′ti-nib)
**Imbruvica**
*Func. class.:* Antineoplastic-biologic response modifier
*Chem. class.:* Signal transduction inhibitor (STI), kinase inhibitor

**ACTION:** Irreversible inhibitor of Bruton's tyrosine kinases in B cells responsible for tumor growth

**Therapeutic outcome:** Decrease in progression of disease

**USES:** Recurrent mantle cell lymphoma in patients who have received at least 1 prior treatment, Waldenstrom's macroglobulinemia/ chronic lymphocytic leukemia (CLL), or small lymphocytic lymphoma who have received at least one prior treatment

## CONTRAINDICATIONS
Pregnancy, breastfeeding, hypersensitivity

**Precautions:** Children, geriatric patients, active infections, anticoagulant therapy, bleeding, hepatic/renal disease, neutropenia, surgery

## DOSAGE AND ROUTES
**Mantle cell lymphoma who have received at least one prior treatment**
**Adult: PO** 560 mg (4×140 mg caps)/day
CLL, Waldenstrom's macroglobulinemia
**Adult:** PO 420 mg daily until disease progression

**Dosage adjustment for ≥ grade 3 nonhematologic toxicities, ≥ grade 3 neutropenia with infection or fever, or grade 4 hematologic toxicities**
Interrupt therapy; resume upon recovery to grade 1 or baseline as indicated here:
• **First occurrence:** resume dosing at original dose (daily dose = 560 mg/day)
• **Second occurrence:** reduce dose by 1 capsule (daily dose = 420 mg/day)
• **Third occurrence:** reduce dose by 2 capsules (daily dose = 280 mg/day)
• **Fourth occurrence:** discontinue

**Available forms:** Caps 140 mg

### Implementation

- Give at same time of day with water; if dose is missed, take as soon as possible on same day; do not double
- Do not open, break, chew cap
- Use safe handling procedures
- Store at room temperature, avoid moisture

## ADVERSE EFFECTS

**CNS:** Fatigue, fever
**CV:** Hypertension, atrial fibrillation, peripheral edema
**EENT:** Sinusitis
**GI:** Nausea, vomiting, dyspepsia, anorexia, abdominal pain, constipation, stomatitis, diarrhea, GI bleeding
**GU:** Increased serum creatinine, UTI, renal failure
**HEMA:** Neutropenia, thrombocytopenia, anemia, bleeding, epistaxis, transient lymphocytosis
**INTEG:** Rash, skin infections
**MS:** Pain, arthralgia, muscle cramps
**RESP:** Cough, dyspnea
**SYST:** Secondary malignancy, infection

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 97.3% |
| **Metabolism** | By CYP3A4/CYP2D6 |
| **Excretion** | Primarily in feces, small amount in urine |
| **Half-life** | Terminal 4-8 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Moderate or strong CYP3A4 inducers: decreased ibrutinib effect; avoid concurrent use
Moderate or strong CYP3A4 inhibitors (clarithromycin, indinavir, itraconazole, nelfinavir, posaconazole, ritonavir, saquinavir, voriconazole): increased ibrutinib effect; avoid concurrent use

### Drug/food

Grapefruit juice: increased plasma concentrations

### Drug/herb

St. John's wort: decreased SUNItinib concentration

## NURSING CONSIDERATIONS

### Assessment

#### Drug/lab test

- Increase: Lymphocytes, uric acid, creatinine
- **Secondary malignancies:** Monitor for new malignancies
- **Bleeding:** bruising, grade 3 or higher bleeding events may occur, may be fatal
- **Hypersensitivity:** Fever, itching, wheezing, swelling of face, lips, tongue, stop product immediately
- **Pregnancy:** Identify if pregnancy is planned or suspected, if breastfeeding, do not use in pregnancy, breastfeeding
- Monitor hepatic/renal function, signs/symptoms of infection
- Renal failure: Monitor for renal function (BUN, creatinine) maintain hydration, monitor for hyperuricemia
- **Infection:** Monitor for fever, sore throat malaise, infection may be fatal
- **Cardiac changes/hypertension:** Monitor B/P

#### Patient/family education

- Teach patient about reason for treatment, expected result
- Teach patient that many adverse reactions may occur: high B/P, bleeding, mouth swelling, trouble breathing
- Teach patient to avoid persons with known upper respiratory infections; that immunosuppression is common
- Teach patient to avoid grapefruit juice or medications, herbs; there are many interactions
- Teach patient to report if pregnancy is planned or suspected, if breastfeeding
- Teach patient to take with water at same time each day; do not open, break, or chew
- Teach patient to report immediately trouble breathing, fever, itching, wheezing, swelling of face, lips, tongue, stop product

#### Evaluation

**Positive therapeutic outcome**

- Decrease in progression of disease

## ibuprofen (OTC, Rx)

(eye-byoo-proe'fen)
**Advil, Caldolor, Ibuprohm, Ibutab, Midol, Motrin, Motrin IB, Pamprin IB, Profen, Tab-Profen**

## ibuprofen lysine (Rx)

**NeoProfen**

*Func. class.:* NSAID

**ACTION:** Inhibits COX-1, COX-2 by blocking arachidonate; analgesic, antiinflammatory, antipyretic

**Therapeutic outcome:** Decreased pain, inflammation, fever

**USES:** Rheumatoid arthritis, osteoarthritis, primary dysmenorrhea, dental pain, musculoskeletal disorders, fever, migraine, patent ductus arteriosus

## CONTRAINDICATIONS

Avoid pregnancy 3rd trimester, hypersensitivity to this product, NSAIDs, salicylates, asthma, severe renal/hepatic disease, Perioperative pain in CABG

**Precautions:** Pregnancy (1st and 2nd trimester), breastfeeding, children, geriatric, bleeding disorders, GI disorders, cardiac disorders, hypersensitivity to other antiinflammatory agents, HF, CCr <25 ml/min

**BLACK BOX WARNING:** GI bleeding, MI, stroke

## DOSAGE AND ROUTES

### Self-treatment of minor aches/pain

**Adult/adolescent:** PO (OTC product) 200 mg q4-6hr, may increase to 400 mg q4-6hr; max 1200 mg/day

### Analgesia

**Adult:** PO 200-400 mg q4-6hr; max 3.2 g/day; OTC use max 1200 mg/day
**Child:** PO 4-10 mg/kg/dose q6-8hr

### Moderate to severe pain (hospitalized patients) (Caldolor)

**Adult:** **IV** 400-800 mg q6hr as an adjunct to opiate agonist therapy

### Dysmenorrhea

**Adult:** PO 400 mg q4-6hr; max 1200 mg/day

### Antipyretic

**Child 6 mo-12 yr:** PO 5 mg/kg (temp <102.5° F or 39.2° C), 10 mg/kg (temp >102.5° F), may repeat q6-8hr; max 40 mg/kg/day

### Antiinflammatory

**Adult:** PO 400-800 mg tid-qid; max 3.2 g/day
**Child:** PO 30-40 mg/kg/day in 3-4 divided doses; max 50 mg/kg/day

### Juvenile arthritis

**Child:** PO 30-40 mg/kg/day (oral suspension) in 3-4 divided doses

### Patent ductus arteriosus (PDA) (Neoprofen)

**Premature neonate ≤32 wk gestation who weighs 500-1500 g:** **IV** 10 mg/kg initially, then if needed, 2 doses 5 mg/kg at 24 hr intervals; if oliguria occurs, hold dose

**Available forms:** caps 200 mg, Tabs 100, 200, 300, 400, 600, 800 mg; liqui-gel caps 200 mg; oral susp 40 mg/ml, 100 mg/5 ml; liquid 100 mg/5 ml; chew tabs 50, 100 mg; oral drops 50 mg/1.25 ml; inj 10 mg/ml (NeoProfen)

### Implementation

**PO route**

- Administer to patient crushed or whole; 800-mg tab may be dissolved in water
- Give with food or milk to decrease gastric symptoms; give 2 hr before or 30 min after meals; absorption may be slowed
- Shake susp well before use
- Store at room temperature
- Do not use in pregnancy after 30 wk gestation

**IV route**

- Must be well hydrated prior to administration
- Dilute to ≤4 mg/ml (0.9% NaCl, LR, $D_5W$); infuse over ≥30 min
- Discard unused portion

**Intermittent IV infusion route**

- Visually inspect for particulate
- Ibuprofen lysine: dilute with dextrose or saline to appropriate volume (10 mg/ml of ibuprofen is recommended) given within 30 min of preparation: give via port that is nearest insertion site; give over 15 min
- Check for extravasation; do not give in same line with TPN, interrupt TPN for 15 min before and after product administration

## ADVERSE EFFECTS

**CNS:** *Headache,* dizziness, drowsiness, fatigue, tremors, confusion, insomnia, anxiety, depression
**CV:** Tachycardia, peripheral edema, palpitations, dysrhythmias, CV thrombotic events, MI, stroke
**EENT:** Tinnitus, hearing loss, blurred vision
**GI:** *Nausea, anorexia,* vomiting, diarrhea, jaundice, hepatitis, constipation, flatulence, cramps, dry mouth, peptic ulcer, GI bleeding, ulceration, necrotizing enterocolitis, GI perforation
**GU:** Nephrotoxicity, dysuria, hematuria, oliguria, azotemia
**HEMA:** Blood dyscrasias, increased bleeding time
**INTEG:** Purpura, rash, pruritus, sweating, urticaria, necrotizing fasciitis, photosensitivity, photophobia
**META:** Hyperkalemia, hyperuricemia, hypoglycemia, hyponatremia
**SYST:** Anaphylaxis, Stevens-Johnson syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Not known; crosses placenta |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys, unchanged (10%) |
| **Half-life** | 1.8-2 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ½ hr |
| **Peak** | 1-2 hr |
| **Duration** | 4-6 hr |

## INTERACTIONS

### Individual drugs

Alcohol, aspirin: increased GI reactions
Aspirin: decreased ibuprofen action
CycloSPORINE, lithium, methotrexate: increased toxicity
Furosemide: decreased effect of furosemide
Radiation: increased risk of blood dyscrasias
Valproic acid, warfarin: increased risk of bleeding

### Drug classifications

Anticoagulants, antiplatelet agents, salicylates, SSRIs, thrombolytics: increased risk of bleeding
Anticoagulants (oral): increased toxicity
Antidiabetics (oral): increased hypoglycemia
Antihypertensives: decreased effect of antihypertensives
Antineoplastics: increased risk of blood dyscrasias
Corticosteroids, NSAIDs: increased GI reactions
Diuretics: decreased effectiveness of diuretics (thiazides)

### Drug/herb

Feverfew, garlic, ginger, ginkgo, ginseng *(Panax)*, horse chestnut, red clover: increased risk of bleeding

### Drug/lab test

Increased: BUN, creatinine, LFTs, potassium
Decreased: Hgb/Hct, blood glucose, WBC, platelets

## NURSING CONSIDERATIONS

### Assessment

- **Beers:** Avoid chronic use in older adults, unless other alternatives are not effective, increased risk of GI bleeding
- **Assess for infection;** may mask symptoms
- **Assess pain:** location, duration, type, intensity before dose, 1 hr after
- Assess musculoskeletal status: ROM before dose, 1 hr after
- Monitor liver function tests: AST, ALT, bilirubin, creatinine if patient is on long-term therapy, monitor electrolytes as needed, make sure patient is well hydrated
- **Perioperative pain in CABG:** MI and stroke can result for 10-14 days, can be fatal, those taking NSAIDs are at greater risk of MI and stroke, even in first few weeks of therapy
- **Serious skin disorders:** For skin rash, swelling of lips, face, tongue, discontinue immediately, provide supportive care
- **Nephrotoxicity:** Monitor renal function tests: BUN, urine creatinine if patient is on long-term therapy
- Assess cardiac status: edema (peripheral), tachycardia, palpitations; monitor B/P, pulse for character, quality, rhythm
- Monitor blood studies: CBC, Hct, Hgb, prothrombin time if patient is on long-term therapy
- Check I&O ratio; decreasing output may indicate renal failure if patient is on long-term therapy
- Assess for history of peptic ulcer disorder; asthma, aspirin, hypersensitivity, check closely for hypersensitivity reactions

> **BLACK BOX WARNING: GI bleeding/perforation:** chronic use can cause gastritis with or without bleeding; in those with a prior history of peptic ulcer disease or GI bleeding, initiate treatment at lower dose; geriatrics are at greater risk, as are those who consume >3 alcohol drinks/day

- **PDA closure:** Monitor for bleeding, oliguria, infection in preterm neonates, use only doses needed for ductus arteriosus closure
- **Dysmenorrhea:** Give at onset of menses
- **Assess for allergic reactions:** rash, urticaria; if these occur, product may have to be discontinued
- Assess for vision changes: blurring, halos; may indicate corneal, retinal damage
- Identify prior product history; there are many product interactions
- Identify fever: length of time in evidence and related symptoms
- **Pregnancy:** Identify if pregnancy is planned or suspected, if breastfeeding

### Patient/family education

- Teach patient to use sunscreen, sunglasses, and protective clothing to prevent photosensitivity, photophobia
- Advise patient to read label on other OTC products
- Inform patient that the therapeutic response takes 1 mo (arthritis)
- Teach patient to take with a full glass of water, sit upright for 30 min after use

- Caution patient to avoid alcohol ingestion, salicylates, NSAIDs; GI bleeding may occur
- Advise patient with allergies that allergic reactions may develop
- Advise patient to use sunscreen to prevent photosensitivity
- Advise patient to report use of this product to all health care providers
- **Nephrotoxicity:** advise to report change in urinary pattern, weight increase, edema, increased pain in joints, fever, blood in urine; monitor fluid status, BUN, creatinine
- **Pregnancy:** notify prescriber if pregnancy is planned or suspected; avoid during 3rd trimester; pregnancy IV after 30 wk
- Teach patient to avoid driving or other hazardous activities until effect is known

**BLACK BOX WARNING:** MI/stroke: Teach patient to report signs/symptoms of MI/stroke immediately and discontinue product, seek emergency medical treatment

### Evaluation

**Positive therapeutic outcome**

- Decreased pain
- Decreased inflammation
- Decreased fever
- Increased mobility

## TREATMENT OF OVERDOSE:

Lavage, induce diuresis

**⚠ HIGH ALERT**

# ibutilide (Rx)

(eye-byoo'te-lide)

**Corvert**

*Func. class.:* Antidysrhythmic (Class III)

*Chem. class.:* Methane sulfonamide

## ACTION:

Prolongs duration of action potential and effective refractory period

## USES:

For rapid conversion of atrial fibrillation/flutter occurring within 1 wk of coronary artery bypass or valve surgery

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children <18 yr; geriatric, sinus node dysfunction, 2nd- or 3rd-degree AV block, electrolyte imbalances, bradycardia, renal/hepatic disease, HF

**BLACK BOX WARNING:** QT prolongation, torsades de pointes, ventricular arrhythmias, ventricular tachycardia, cardiac dysrhythmias, atrial fibrillation

## DOSAGE AND ROUTES

### Atrial fibrillation/flutter

**Adult: IV** INF (≥60 kg) 1 vial (1 mg) given over 10 min, may repeat same dose in 10 min; **IV** INF (<60 kg) 0.01 mg/kg given over 10 min, may repeat same dose in 10 min

**Available forms:** Inj 1 mg/10 ml

### Implementation

**IV route**

- Give reduced dosage slowly with ECG monitoring only
- Give undiluted or diluted in 50 ml of 0.9% NaCl or $D_5W$ (0.017 mg/ml), give over 10 min
- Solution is stable for 48 hr refrigerated or 24 hr at room temperature
- Do not admix with other solution, products
- Ice compress after stopping inf for extravasation; remove tubing and attempt to aspirate product, elevate affected areas
- Stop infusion as soon as arrhythmia is stopped
- Do not use if discolored or if particulate is present

## ADVERSE EFFECTS

**CNS:** *Headache*

**CV:** *Hypotension, bradycardia,* sinus arrest, HF, dysrhythmias, hypertension, extrasystoles, ventricular tachycardia, bundle branch block, AV block, palpitations, supraventricular extrasystoles, syncope, prolonged QT interval, torsades de pointes

**GI:** Nausea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Kidney |
| **Half-life** | 6 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Digoxin: masking of cardiotoxicity

### Drug classifications

Antidepressants (tricyclics/tetracyclics): prodysrhythmia

Antihistamines, $H_2$-receptor antagonists, antidepressants, tetracyclines, tricyclics, phenothiazines: increased prodysrhythmia

Class Ia antidysrhythmics (disopyramide, quiNIDine, procainamide), class III agents (amiodarone, sotalol): do not use within 5 hr of ibutilide, QT prolongation may occur

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** ECG continuously for >4 hr to determine product effectiveness; measure PR, QRS, QT intervals, check for PVCs, other dysrhythmias; discontinue if atrial fibrillation/flutter ceases; continue until QT interval corrected for heart rate (QTc) returns to baseline; if used ≥2 days, anticoagulation must be adequate

- Monitor I&O ratio; monitor electrolytes: potassium, sodium, chloride
- Monitor liver function tests: AST, ALT
- Monitor for dehydration or hypovolemia
- Assess for CNS symptoms: confusion, psychosis, numbness, depression, involuntary movements; if these occur product should be discontinued
- Monitor cardiac rate, respiration; rate, rhythm, character, chest pain, ventricular tachycardia, supraventricular tachycardia or fibrillation
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, avoid breastfeeding, excretion unknown

### Patient/family education

- Instruct patient to report side effects immediately to prescriber
- About reason for medication

### Evaluation

**Positive therapeutic outcome**

- Decrease in atrial fibrillation/flutter

**⚠ HIGH ALERT**

## ifosfamide (Rx)

(i-foss′fa-mide)

**Ifex**

*Func. class.:* Antineoplastic alkylating agent

*Chem. class.:* Nitrogen mustard

**Do not confuse:** ifosfamide/cyclophosphamide

**ACTION:** Alkylates DNA, RNA; inhibits enzymes that allow synthesis of amino acids in proteins; also responsible for cross-linking DNA strands; activity is not cell cycle stage specific

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** Testicular cancer

**Unlabeled uses:** Soft-tissue sarcoma, Ewing's sarcoma, thymic cancer, rhabdomyosarcoma

## CONTRAINDICATIONS

Pregnancy, hypersensitivity

**BLACK BOX WARNING:** Bone marrow suppression

**Precautions:** Renal/hepatic disease, breastfeeding, children, accidental exposure, dehydration, dental disease, infection, IM injection, ocular exposure, varicella

**BLACK BOX WARNING:** Coma, hemorrhagic cystitis

## DOSAGE AND ROUTES

### Germ Cell Testicular Cancer

**Adult: IV** 1.2-2 g/m$^2$/day × 5 days; repeat course q3wk; give with mesna, in combination with 1-2 other antineoplastic agents

### Renal dose

**Adult:** IV CCr 31-60 ml/min give 75% of dose; CCr 10-30 ml/min give 50% of dose; CCr <10 ml/min, do not give

**Available forms:** Inj 1, 3 g vials

### Implementation

- Administer antiemetic 30-60 min before product to prevent vomiting
- Visually inspect parenteral products for particulate matter and discoloration prior to use
- Store powder at room temperature

**IV route**

- Give as an intermittent infusion or continuous infusion
- Well hydrate with at least 2 L/day of oral or IV fluids should be given to prevent bladder toxicity
- Must be given in combination with mesna to prevent hemorrhagic cystitis
- Close hematologic monitoring is recommended. WBC count, platelet count, and hemoglobin should be obtained prior to each use and periodically thereafter
- A urinalysis should be performed prior to each dose to monitor for hematuria

**Reconstitution and further dilution**

- Reconstitute 1 or 3 g with 20 or 60 ml, respectively, of sterile water for injection or bacteriostatic water for injection containing parabens or benzyl alcohol to give IV solutions containing 50 mg/ml
- Solutions may be diluted further to achieve concentrations of 0.6-20 mg/ml in the following solutions: $D_5W$, NS, LR
- Infuse slowly over at least 30 min
- Diluted and reconstituted solutions refrigerated and used within 24 hours

**Y-site compatibilities:** Acyclovir, Alatrofloxacin, alemtuzumab, alfentanil, allopurinol, Amifostine, amikacin, Aminocaproic acid, aminophylline, amiodarone, amphotericin B cholesteryl (Amphotec), amphotericin B conventional colloidal, amphotericin B lipid complex (Abelcet), amphotericin B liposome (AmBisome), ampicillin, ampicillin-sulbactam, anidulafungin, argatroban, Arsenic trioxide, atenolol, Atracurium, azithromycin, Aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, Butorphanol, Calcium chloride/gluconate, CARBOplatin, Caspofungin, ceFAZolin, Cefoperazone, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, cefTAZidime (L-arginine), ceftizoxime, cefTRIAXone, cefuroxime, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, codeine, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, DAUNOrubicin liposome, dexamethasone phosphate, dexmedetomidine, Dexrazoxane, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doripenem, Doxacurium, DOXOrubicin, DOXOrubicin liposomal, doxycycline, droperidol, enalaprilat, Ephedrine, EPINEPHrine, epirubicin, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, Fludarabine, fluorouracil, foscarnet, fosphenytoin, furosemide, Gallium nitrate, ganciclovir, gatifloxacin, gemcitabine, Gemtuzumab, gentamicin, granisetron, haloperidol, heparin, hydrocortisone phosphate/succinate, HYDROmorphone, hydrOXYzine, IDArubicin, imipenem-cilastatin, inamrinone, insulin, regular, Isoproterenol, ketorolac, labetalol, lansoprazole, lepirudin, leucovorin, levofloxacin, Levorphanol, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, melphalan, meperidine, meropenem, Mesna, Methohexital, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, minocycline, mitoMYcin, mitoXANtrone, Mivacurium, morphine, moxifloxacin, Nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ofloxacin, ondansetron, oxaliplatin, PAClitaxel (solvent/surfactant), palonosetron, pamidronate, pancuronium, PEMEtrexed, pentamidine, PENTobarbital, Phenobarbital, phenylephrine, piperacillin, piperacillin-tazobactam, potassium acetate/chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, Quinupristin-Dalfopristin, ranitidine, Rapacuronium, remifentanil, riTUXimab, rocuronium, sargramostim, sodium acetate/bicarbonate/phosphates, succinylcholine, Sufentanil, sulfamethoxazole-trimethoprim, tacrolimus, Teniposide, theophylline, Thiopental, Thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA (3-in-1), tobramycin, topotecan, TPN (2-in-1), trastuzumab, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

**Additive compatibilities:** CARBOplatin, CISplatin, epirubicin, etoposide, fluorouracil, mesna

## ADVERSE EFFECTS

**CNS:** Facial paresthesia, fever, malaise, somnolence, confusion, depression, hallucinations, dizziness, disorientation, seizures, coma, cranial nerve dysfunction, encephalopathy

**GI:** Nausea, vomiting, anorexia, hepatotoxicity, stomatitis, constipation, diarrhea, dyslipidemia, hyperglycemia

**GU:** Hematuria, nephrotoxicity, hemorrhagic cystitis, dysuria, urinary frequency, retrograde ejaculation

**HEMA:** Thrombocytopenia, leukopenia, anemia

**INTEG:** Dermatitis, alopecia, pain at inj site, hyperpigmentation

**META:** Metabolic acidosis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete bioavailability |
| **Distribution** | Saturation at high dosages |
| **Metabolism** | Liver |
| **Excretion** | Breast milk |
| **Half-life** | 15 hr, depends on dose |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Allopurinol: increased toxicity
Radiation: increased bone marrow suppression

### Drug classifications

Anticoagulants, NSAIDs, salicylates, thrombolytics: increased bleeding risk
Antineoplastics: increased bone marrow suppression
CYP3A4 inducers, barbiturates: increased toxicity
CYP3A4 inhibitors: decreased ifosfamide effect
Live virus vaccines: decreased antibody response
Do not use within 24 hr of hematopoietic progenitor cells

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Bone Marrow Suppression:** Monitor CBC, differential, platelet count weekly; withhold product if WBC is $<2000$ mm$^3$ or platelet count is $<50,000$; notify prescriber of results if WBC $<10,000$/mm$^3$, platelets $<100,000$/mm$^3$, severe myelosuppression

- Monitor renal function studies: BUN, serum uric acid, urine CCr before, during therapy; I&O ratio; report fall in urine output of 30 ml/hr
- Monitor for cold, fever, sore throat (may indicate beginning of infection); identify edema in feet and joints, stomach pain, shaking; prescriber should be notified
- Monitor B/P, pulse respirations baseline and periodically during treatment
- Assess for bleeding: hematuria, guaiac, bruising or petechiae, mucosa or orifices; no rect temp, avoid IM injections

**BLACK BOX WARNING: Hemorrhagic cystitis:** I&O ratio; monitor for hematuria; hemorrhagic cystitis can occur; increase fluids to 3 L/day; urinalysis prior to each dose; do not give at night

- Monitor liver function tests before, during therapy (ALT, AST, LDH); jaundice of skin, sclera, dark urine, clay-colored stools, itching, abdominal pain, fever, diarrhea that may indicate liver involvement

**BLACK BOX WARNING: Neurotoxicity:** Assess for neurologic symptoms: Hallucinations, confusion, disorientation, coma; product should be discontinued

- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

- Teach patient to avoid use of products containing aspirin or NSAIDs, razors, commercial mouthwash, since bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools)
- Instruct patient to report signs of anemia (fatigue, headache, irritability, faintness, shortness of breath)
- Advise patient to report any changes in breathing or coughing even several mo after treatment; to avoid crowds and persons with respiratory tract or other infections
- Teach patient that hair loss is common; discuss the use of wigs or hairpieces; that hair may be a different texture when regrowth occurs
- Caution patient not to have any live virus vaccinations without the advice of the prescriber; serious reactions can occur for 3 months–1 yr, to discuss encephalopathy, neurotoxicity
- Teach patient to notify prescriber if pregnancy is planned or suspected, pregnancy
- Advise patient that contraception is needed during treatment and for several mo after completion of therapy
- Advise patient to report confusion, hallucinations, extreme drowsiness, numbness, tingling; avoid use of alcohol for $\geq 4$ months after treatment
- Teach patient to avoid driving, hazardous activities until reaction is known

**BLACK BOX WARNING:** Instruct patient to drink extra fluids in order to urinate often to prevent hemorrhagic cystitis, to report pink or red urine

### Evaluation

**Positive therapeutic outcome**

- Prevention of rapid division of malignant cells
- Absence of swelling at night
- Increased appetite, increased weight

## iloperidone (Rx)

(ill-o-pehr′ih-dohn)

**Fanapt**

*Func. class.:* Antipsychotic

*Chem. class. second-generation atypical:* Benzisoxazole derivative

**Do not confuse:** Fanapt/Xanax

**ACTION:** Unknown; may be mediated through both dopamine type 2 ($D_2$) and serotonin type 2 ($5\text{-}HT_2$) antagonism; high receptor binding affinity for norepinephrine (alpha 1)

**Therapeutic outcome:** Decreased signs/symptoms of schizophrenia

**USES:** Schizophrenia

## CONTRAINDICATIONS

Breastfeeding, hypersensitivity

**Precautions:** Pregnancy, children, geriatric patients, renal/hepatic disease, breast cancer, Parkinson's disease, dementia with Lewy bodies, seizure disorder, QT prolongation, bundle branch block, acute MI, ambient temperature

increase, AV block, stroke, substance abuse, suicidal ideation, tardive dyskinesia, torsades de pointes, blood dyscrasias, dysphagia

**BLACK BOX WARNING:** Increased mortality in elderly patients with dementia-related psychosis

## DOSAGE AND ROUTES

**Adult:** PO 1 mg bid, may increase to target dose of 6-12 mg bid with daily dose adjustment of max 2 mg bid; titrate slowly; max 24 mg/day in two divided doses; reduce dose by 50% in poor metabolizer of CYP2D6 or when used with strong CYP2D6/CYP3A4 inhibitors

**Available forms:** Tabs 1, 2, 4, 6, 8, 10, 12 mg; titration pack

### Implementation

- Give reduced dose in geriatric patients
- Give anticholinergic agent on order from prescriber, to be used for EPS
- Avoid use with CNS depressants
- Provide decreased stimulus by dimming lights, avoiding loud noises
- Provide supervised ambulation until patient is stabilized on medication; do not involve in strenuous exercise program because fainting is possible; patient should not stand still for a long time
- Give increased fluids to prevent constipation
- Provide sips of water, candy, gum for dry mouth
- Store in tight, light-resistant container (PO); store unopened vials in refrigerator; protect from light; do not freeze

## ADVERSE EFFECTS

**CNS:** *EPS, pseudoparkinsonism, akathisia, dystonia, tardive dyskinesia; drowsiness,* seizures, neuroleptic malignant syndrome, dizziness, delirium, depression, paranoia, fatigue, hostility, lethargy, restlessness, vertigo, tremor, drowsiness
**CV:** Orthostatic hypotension, heart failure, AV block, QT prolongation, tachycardia
**EENT:** Blurred vision, cataracts, nystagmus, tinnitus
**GI:** *Nausea,* vomiting, *anorexia, constipation,* jaundice, weight gain/loss, abdominal pain, stomatitis, xerostomia
**GU:** Hyperprolactinemia, urinary retention/incontinence, testicular pain, renal failure
**MISC:** Renal artery occlusion
**HEMA:** Agranulocytosis, leukopenia, neutropenia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Extensively, liver (major metabolite) CYP2D6, CYP3A4 |
| **Excretion** | Urine |
| **Half-life** | Terminal 18 hr extensive metabolizers; 33 hr poor metabolizers |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol: increased sedation
Chloroquine, clarithromycin, droperidol, erythromycin, haloperidol, methadone, pentamidine: increased QT prolongation

### Drug classifications

CYP2D6, CYP3A4 inducers (carBAMazepine, barbiturates, phenytoins, rifampin): decreased iloperidone action
CYP2D6, CYP3A4 inhibitors (delavirdine, indinavir, itraconazole, dalfopristin, ritonavir, tipranavir): increased iloperidone effect, decreased clearance, reduce dose
Class IA/ III antidysrhythmics, some phenothiazines, β-agonists, local anesthetics, tricyclics: increased QT prolongation
Other CNS depressants: increased sedation
SSRIs, SNRIs, serotonin-agonists: increased serotonin syndrome, neuroleptic malignant syndrome

### Drug/lab test

Increased: prolactin levels, cholesterol, glucose, lipids, triglycerides
Decreased: potassium

## NURSING CONSIDERATIONS

### Assessment

- Assess AIMS assessment, lipid panel, blood glucose, CBC, glycosylated hemoglobin A1C, LFTs, neurologic function, pregnancy test, serum creatinine, electrolytes, prolactin, thyroid function studies, weight
- Assess affect, orientation, LOC, reflexes, gait, coordination, sleep pattern disturbances
- Monitor B/P standing and lying; also pulse, respirations; take these often during initial treatment; establish baseline before starting treatment; report drops of 30 mm Hg; watch for ECG changes; QT prolongation may occur

• Assess for dizziness, faintness, palpitations, tachycardia on rising
• **Assess for EPS,** including akathisia, tardive dyskinesia (bizarre movements of the jaw, mouth, tongue, extremities), pseudoparkinsonism (rigidity, tremors, pill rolling, shuffling gait)
• **Beers:** Avoid in older adults except for schizophrenia, bipolar disorder or short-term use as an antiemetic during chemotherapy, increased risk of stroke

**BLACK BOX WARNING:** Assess for serious reactions in the geriatric patient: fatal pneumonia, heart failure, sudden death, not to be used in the elderly with dementia

• **Assess for neuroleptic malignant syndrome:** hyperthermia, increased CPK, altered mental status, muscle rigidity, seizures, diaphoresis, discontinue immediately, notify prescriber
• Assess for constipation, urinary retention daily; if these occur, increase bulk and water in diet
• Monitor weight gain, BMI, waist circumference, hyperglycemia, metabolic changes in diabetes
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, infant exposed to product during third trimester may exhibit extrapyramidal symptoms; do not breastfeed, excretion unknown

### Patient/family education

• Teach that orthostatic hypotension may occur and to rise from sitting or lying position gradually
• Advise to avoid hot tubs, hot showers, tub baths; hypotension may occur
• Teach to avoid abrupt withdrawal of this product; EPS may result; product should be withdrawn slowly; to review symptoms of neuroleptic malignant syndrome
• Teach to avoid OTC preparations (cough, hay fever, cold) unless approved by prescriber; serious product interactions may occur; avoid use of alcohol; increased drowsiness may occur
• Advise to avoid hazardous activities if drowsy or dizzy
• Teach compliance with product regimen
• Teach to report impaired vision, tremors, muscle twitching
• Teach that heat stroke may occur in hot weather; take extra precautions to stay cool
• Advise to use contraception; inform prescriber if pregnancy is planned or suspected
• Advise patient to use gum, lozenges for dry mouth

### Evaluation

**Positive therapeutic outcome**
• Decrease in emotional excitement, hallucinations, delusions, paranoia; reorganization of patterns of thought, speech

## TREATMENT OF OVERDOSE:

Lavage if orally ingested; provide airway; *do not induce vomiting*

**⚠ HIGH ALERT**

## imatinib (Rx)

(im-ah-tin'ib)
**Gleevec**
*Func. class.:* Antineoplastic—miscellaneous
*Chem. class.:* Protein-tyrosine kinase inhibitor

**ACTION:** Inhibits Bcr-Abl tyrosine kinase created in chronic myeloid leukemia (CML), also inhibits tyrosine kinases including EGF, FGF, PDGF, SCF, VEGF, NGF

**Therapeutic outcome:** Decreased tumor size, prevention of spread of cancer

**USES:** Treatment of chronic myeloid leukemia (CML), Philadelphia chromosome positive in blast cell crisis or chronic failure; gastrointestinal stromal tumors (GIST), positive for C-KIT; chronic eosinophilic leukemia, Philadelphia chromosome positive (PH+), acute lymphocytic leukemia, dermatofibrosarcoma protuberans, myelodysplastic syndrome, systemic mastocytosis

## CONTRAINDICATIONS

Pregnancy, hypersensitivity

**Precautions:** Breastfeeding, children, geriatric, cardiac/renal/hepatic/dental disease, GI bleeding, bone marrow suppression, infection, thrombocytopenia, neutropenia, immunosuppression

## DOSAGE AND ROUTES

**Treatment of Philadelphia chromosome positive (Ph+) chronic myelogenous leukemia (CML) chronic phase as initial therapy**

**Adult:** PO 400 mg/day, continue as long as is beneficial; may increase to 600 mg/day in the absence of severe adverse reactions and severe non-leukemia–related neutropenia or thrombocytopenia

**Adolescent/child >2 yr:** PO 340 mg/m$^2$/day, max 600 mg/day; daily dose may be given as a

single dose or split into 2 doses given once in the morning and once in the evening

### Adult patients with Ph+ CML in chronic phase after failure of interferon-alfa therapy

**Adult:** PO 400 mg/day; continue as long as is beneficial; may increase to 600 mg/day

### Pediatric patients with Ph+ CML in chronic phase whose disease has recurred after hematopoietic stem cell transplant or who are resistant to interferon-alfa therapy

**Adolescent/child >3 yr:** PO 260 mg/m²/day; may be given as single daily dose or may be divided and given once in the morning and once in the evening; may increase to 340 mg/m²/day

### Adult patients with Ph+ CML in accelerated phase or blast crisis

**Adult:** PO 600 mg/day, continue as long as is beneficial, may increase to 800 mg/day (400 mg bid)

### Adult patients with resistant or relapsed Ph+ acute lymphocytic leukemia (ALL)

**Adult:** PO 600 mg/day, continue as long as is beneficial

### Adult patients with *Kit* (CD117) positive unresectable and/or metastatic GIST

**Adult:** PO 400-600 mg/day, may increase to 400 mg bid

### Adjuvant treatment of *Kit* (CD117) positive GIST after complete gross resection

**Adult:** PO 400 mg/day

### Hypereosinophilic syndrome (HES) and/or chronic eosinophilic leukemia (CEL) who have the FIPL1L1-PDGFR alpha fusion kinase (mutational analysis or FISH demonstration of CHIC2 allele deletion) and for patients with HES and/or CEL who are FIPL1L-PDGFR alpha fusion kinase negative or unknown

**Adult:** PO 400 mg/day in those who are FIPL1L-PDGFR alpha fusion kinase negative or unknown; for HES/CEL patients with demonstrated FIP1L1-PDGFR alpha fusion kinase, 100 mg/day, may increase to 400 mg

### Myelodysplastic syndrome (MDS)/myeloproliferative disease (MPD) associated with the PDGFR (platelet-derived growth factor receptor) gene rearrangements

**Adult:** PO 400 mg/day

### Aggressive systemic mastocytosis (ASM) without D816V c-Kit mutation or with c-Kit mutation status unknown

**Adult:** PO 400 mg/day in those without the FIP1L1-PDGFR alpha c-Kit mutation. If c-Kit status is unknown or not available, give 400 mg/day

### Unresectable, recurrent, and/or metastatic dermatofibrosarcoma protuberans (DFSP)

**Adult:** PO 400 mg bid (800 mg/day)

### Hepatic dose

**Adult:** PO total bilirubin 1.5-3 × ULN and any AST, decrease initial dose to 400 mg/day; total bilirubin >3 × ULN and any AST, decrease initial dose to 300 mg/day

### Renal dose

**Adult:** PO CCr 40-59 ml/min, max 600 mg/day; CCr 20-39 ml/min decrease initial dose by 50%, max 400 mg/day; CCr <20 ml/min use with caution 100 mg/day

**Available forms:** Tabs 100, 400 mg

### Implementation

**PO route**

- Give with meal and large glass of water to decrease GI symptoms, doses of 800 mg should be given 400 mg bid
- Tab may be dispersed in a glass of water or apple juice, use 50 ml of liquid for 100 mg tab, 200 ml/400 mg
- Store at 25° C (77° F)
- Continue as long as is beneficial

## ADVERSE EFFECTS

**CNS:** CNS hemorrhage, headache, dizziness, insomnia, subdural hematoma
**CV:** Hemorrhage, heart failure, cardiac tamponade, cardiac toxicity
**EENT:** Blurred vision, conjunctivitis
**GI:** *Nausea,* hepatotoxicity, *vomiting, dyspepsia,* GI hemorrhage, *anorexia,* abdominal pain, GI perforation, diarrhea
**HEMA:** Neutropenia, thrombocytopenia, bleeding, hypereosinophilia
**INTEG:** *Rash, pruritus,* alopecia, photosensitivity, drug rash with eosinophilia and systemic symptoms (DRESS)
**META:** Edema, fluid retention, hypokalemia
**MISC:** Fatigue, epistaxis, pyrexia, night sweats, increased weight, flulike symptoms, hypothyroidism, tumor lysis syndrome
**MS:** Cramps, pain, arthralgia, myalgia
**RESP:** Cough, dyspnea, nasopharyngitis, pneumonia, URI, pleural effusion, edema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed; bound to plasma protein (98%) |
| **Distribution** | Unknown |
| **Metabolism** | Liver (metabolites) |
| **Excretion** | Feces, primarily (metabolites) |
| **Half-life** | 18-40 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-4 hr |
| **Duration** | 24 hr (imatinib), 40 hr (metabolite) |

## INTERACTIONS

### Individual drugs

Acetaminophen: increased hepatotoxicity
Simvastatin: increased plasma concentrations
Warfarin: increased plasma concentration of warfarin; avoid coadministration; use low-molecular-weight anticoagulants instead

### Drug classifications

Calcium channel blockers, ergots: increased plasma concentrations
CYP3A4 inducers (carBAMazepine, dexamethasone, PHENobarbital, phenytoin, rifampin): decreased imatinib concentrations
CYP3A4 inhibitors (clarithromycin, erythromycin, ketoconazole, itraconazole): increased imatinib concentrations

### Drug/herb

St. John's wort: decreased imatinib concentration

### Drug/lab test

Increased: bilirubin, amylase, LFTs
Decreased: albumin, calcium, potassium, sodium, phosphate, platelets, neutrophils, leukocytes, lymphocytes

## NURSING CONSIDERATIONS

### Assessment

- **Bone marrow suppression:** Assess ANC and platelets; in chronic phase if ANC $<1 \times 10^9$/L and/or platelets $<50 \times 10^9$/L, stop until ANC $>1.5 \times 10^9$/L and platelets $>75 \times 10^9$/L; in accelerated phase/blast crisis if ANC $<0.5 \times 10^9$/L and/or platelets $<10 \times 10^9$/L, determine whether cytopenia is related to biopsy/aspirate; if not, reduce dose by 200 mg; if cytopenia continues, reduce dose by another 100 mg; if cytopenia continues for 4 wk, stop product until ANC $\geq 1 \times 10^9$/L
- **Assess for hepatotoxicity:** monitor liver function tests before treatment, and qmo, if line transaminases are $>5 \times$ IULN, withhold imatinib until transaminase levels return to $<2.5 \times$ IULN
- **Renal toxicity:** monitor bilirubin, if $>3 \times$ IULN, withhold imatinib until bilirubin levels return to $<1.5 \times$ IULN
- Assess GI symptoms: frequency of stools
- Assess signs of fluid retention, edema: weigh, monitor lung sounds, 50-ml fluid retention is dose dependent
- Monitor CBC for first month, biweekly next month, and periodically thereafter; neutropenia (2-3 wk), thrombocytopenia (3-4 wk) and anemia may occur, may need dosage decrease or discontinuation

### Patient/family education

- **Instruct patient to report adverse reactions immediately:** shortness of breath, swelling of extremities, bleeding
- Teach patient reason for treatment, expected result
- Instruct patient to eat a nutritious diet with iron, vit supplement, low fiber, few dairy products
- Teach patient not to stop or change dose; to avoid hazardous activities until response is known, dizziness may occur
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding
- Teach patient to take with food and water; for those unable to swallow tabs, to mix in liquid (30 ml for 100 mg or 200 ml for 400 mg); after dissolved, stir and consume, avoid grapefruit juice
- Advise patient to avoid OTC products unless approved by prescriber
- Teach patient to notify prescriber if pregnancy is planned or suspected, use effective contraception, do not breastfeed

### Evaluation

**Positive therapeutic outcome**

- Decrease in leukemic cells, size of tumors

## imipenem/cilastatin (Rx)

(i-me-pen'em sye-la-stat'in)
**Primaxin IM, Primaxin IV**
*Func. class.:* Antiinfective, miscellaneous penicillin
*Chem. class.:* Carbapenem

**Do not confuse:** imipenem/Omnipen, Primaxin/Premarin

**ACTION:** Interferes with cell wall replication of susceptible organisms; osmotically unstable cell wall swells and bursts from osmotic pressure; addition of cilastatin prevents renal

inactivation that occurs with high urinary concentrations of imipenem

**Therapeutic outcome:** Bactericidal action against the following: *Streptococcus pneumoniae,* group A β-hemolytic streptococci, *Staphylococcus aureus,* enterococcus; gram-negative organisms: *Klebsiella, Proteus, Escherichia coli, Acinetobacter, Serratia, Pseudomonas aeruginosa; Salmonella, Shigella, Haemophilus influenzae, Listeria* spp.

**USES:** Serious infections caused by gram-positive or gram-negative organisms

## CONTRAINDICATIONS

Hypersensitivity, IM hypersensitivity to local anesthetics of the amide type, or carbapenems, AV block, shock (IM)

**Precautions:** Pregnancy, breastfeeding, children, geriatric, hypersensitivity to cephalosporins, penicillins, seizure disorders, renal disease, head trauma, pseudomembranous colitis, ulcerative colitis, diabetes mellitus

## DOSAGE AND ROUTES

### Doses based on imipenem content

**Intraabdominal infections, gynecologic infections, lower respiratory tract infections, skin and skin structure infections, bone and joint infections, septicemia, endocarditis, febrile neutropenia (unlabeled), and polymicrobial infections for fully susceptible organisms including gram-positive/gram-negative aerobes and anaerobes**

**Adult ≥70 kg: IV** 250 mg q6hr (mild infections); 500 mg q6-8hr (moderate infections); 500 mg q6hr (severe life-threatening infections)

**Adult 60-<70 kg: IV** 250 mg q8hr (mild infections); 250 mg q6hr (moderate or severe life-threatening infections)

**Adult 50-<60 kg: IV** 125 mg q6hr (mild infections) 250 mg q6hr (moderate or severe life-threatening infections)

**Adult 40-<50 kg: IV** 125 mg q6hr (mild infections); 250 mg q6-8hr (moderate infections); 250 mg q6hr (severe life-threatening infections)

**Adult 30-<40 kg: IV** 125 mg q8hr (mild infections); 125 mg q6hr or 250 mg q8hr (moderate infections); 250 mg q8hr (severe life-threatening infections)

**Adolescent/child/infant ≥3 mo: IV** 15-25 mg/kg q6hr

**Infant 1-3 mo weighing ≥1500 g: IV** 25 mg/kg q6hr

**Neonate 1-4 wk weighing ≥1500 g: IV** 25 mg/kg q8hr

**Neonate <7 days weighing ≥1500 g: IV** 25 mg/kg q12hr

**Moderately susceptible organisms, primarily some strains of *P. aeruginosa***

**Adult ≥70 kg: IV** 500 mg q6hr (mild infections); 500 mg q6hr or 1 g q8hr (moderate infections); 1 g q6-8hr (life-threatening infections)

**Adult 60-≤70 kg: IV** 500 mg q8hr (mild infections); 500 mg q8hr or 750 mg q8hr (moderate infections); 0.75-1 g q8hr (life-threatening infections)

**Adult 50-≤60 kg: IV** 250 mg q6hr (mild infections); 250-500 mg q6hr (moderate infections); 500 mg q6hr or 750 mg q8hr (life-threatening infections)

**Adult 40-≤50 kg: IV** 250 mg q6hr (mild infections); 250 mg q6hr or 500 mg q8hr (moderate infections); 500 mg q6-8hr (life-threatening infections)

**Adult 30-≤40 kg: IV** 250 mg q8hr (mild infections); 250 mg q6-8hr; 250 mg q6hr or 500 mg q8hr (life-threatening infections)

**Adolescent/child/infant >3 mo: IV** 15-25 mg/kg q6hr

**Infant 1-3 mo weighing ≥1500 g: IV** 25 mg/kg q6hr

**Neonate 1-4 wk weighing ≥1500 g: IV** 25 mg/kg q8hr

**Neonate <7 days weighing ≥1500 g: IV** 25 mg/kg q12hr

**Mild to moderate lower respiratory tract, skin and skin structure, or gynecologic infections**

**Adult/adolescent/child ≥12 yr:** IM 500 or 750 mg q12hr, max 1.5 g/day

**Mild to moderate intraabdominal infections, including acute gangrenous or perforated appendicitis and appendicitis with peritonitis**

**Adult/adolescent/child ≥12 yr:** IM 750 mg q12hr, max 1.5 g/day

**Community-acquired pneumonia (CAP) in ICU patients with risk factors for *Pseudomonas* infection**

**Imipenem cilastatin in combination with ciprofloxacin or an aminoglycoside plus a respiratory fluoroquinolone or an advanced macrolide**

**Adult ≥70 kg: IV** 500 mg q6-8hr

**Adult 60-≤70 kg: IV** 250 mg q6hr

**Adult 50-≤60 kg: IV** 250 mg q6hr

**Adult 40-≤50 kg: IV** 250 mg q6-8hr

**Adult 30-≤40 kg: IV** 125 mg q6hr or 250 mg q8hr

## Imipenem renal dose

**Adults 70 kg or more:** IV If 70-kg dose is 1 g/day, reduce dose to: CCr 41 to 70 ml/min/1.73 $m^2$: 250 mg q 8 hr; CCr 6 to 40 ml/min/1.73 $m^2$: 250 mg q 12 hr; CCr 5 ml/min/1.73 $m^2$ or less: do not use unless hemodialysis is instituted within 48 hr; If 70-kg dose is 1.5 g/day reduce dose to: CCr 41 to 70 m/min/1.73 $m^2$: 250 mg q 6 hr; CCr 21 to 40 ml/min/1.73 $m^2$: 250 mg q 8 hr; CCr 6 to 20 ml/min/1.73 $m^2$: 250 mg q 12 hr; CCr 5 ml/min/1.73 $m^2$ or less: do not use unless hemodialysis is instituted within 48 hr; If 70-kg dose is 2 g/day, reduce dose to: CCr 41 to 70 ml/min/1.73 $m^2$: 500 mg q 8 hr; CCr 21 to 40 ml/min/1.73 $m^2$: 250 mg q 6 hr; CCr 6 to 20 ml/min/1.73 $m^2$: 250 mg q 12 hr; CCr 5 ml/min/1.73 $m^2$ or less: do not use unless hemodialysis is instituted within 48 hr; If 70-kg dose is 3 g/day, reduce dose to: CCr 41 to 70 ml/min/1.73 $m^2$: 500 mg q 6 hr; CCr 21 to 40 ml/min/1.73 $m^2$: 500 mg q 8 hr; CCr 6 to 20 ml/min/1.73 $m^2$: 500 mg q 12 hr; CCr 5 ml/min/1.73 $m^2$ or less: do not use unless hemodialysis is instituted within 48 hr; If 70-kg dose is 4 g/day, reduce dose to: CCr 41 to 70 ml/min/1.73 $m^2$: 750 mg q 8 hr; CCr 21 to 40 ml/min/1.73 $m^2$: 500 mg q 6 hr; CCr 6 to 20 ml/min/1.73 $m^2$: 500 mg q 12 hr; CCr 5 ml/min/1.73 $m^2$ or less: do not use unless hemodialysis is instituted within 48 hr

**Adult:** IV CCr 60 to 89 ml/min: adjust to 400 mg q6hr for starting dose of 500 mg q6hr; 500 mg q6hr for starting dose of 1 g q8hr; 750 mg q8hr for starting dose of 1 q6hr; CCr 30 to 59 ml/min: adjust to 300 mg q6hr for starting dose of 500 mg q6hr; 500 mg q8hr for starting dose of 1 g q8hr; 500 mg q6hr for starting dose of 1 g q6hr; CCr 15 to 29 ml/min: Adjust to 200 mg q6hr for starting dose of 500 mg q6hr; 500 mg q12hr for starting dose of 1 g q6hr or q8hr; CCr <15 m/min: Do not use unless hemodialysis is instituted within 48 hr

**Available forms:** Powder for inj sol 250, 500; powder for inj susp 500 mg

## Implementation

### IM route

- Reconstitute 500 mg/2 ml lidocaine without epiNEPHrine; shake well, withdraw and administer entire vial; give inj deep in large muscle mass, aspirate, product for IM is not for IV use

### Intermittent IV infusion route

- Reconstitute each 250 or 500 mg/10 ml of compatible diluent; shake well; transfer the resulting susp to ≥100 ml of compatible diluent; add 10 ml to each previously reconstituted vial and shake to ensure all medication is used; transfer the remaining contents of the vial to the inf container; do not administer susp by direct inj
- Give each 250- or 500-mg dose over 20-30 min, and each 1-g dose over 40-60 min; administer over 15-20 min for pediatric patients; do not administer direct **IV**; do not admix with other antibiotics

**Y-site compatibilities:** Acyclovir, alfentanil, amifostine, amikacin, aminocaproic acid, anidulafungin, argatroban, ascorbic acid, atenolol, atracurium, atropine, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, CARBOplatin, caspofungin, ceFAZolin, cefotaxime, cefoTEtan, cefOXitin, ceftAZidime, ceftizone, cefuroxime, chloramphenicol, cimetidine, CISplatin, clindamycin, codeine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, dexamethasone, dexrazoxane, digoxin, diltiazem, diphenhydrAMINE, DOCEtaxel, dolasetron, DOPamine, doxacurium, DOXOrubicin, DOXOrubicin liposomal, doxycycline, enalaprilat, famotidine, fludarabine, foscarnet, granisetron, IDArubicin, regular insulin, melphalan, methotrexate, ondansetron, propofol, tacrolimus, teniposide, thiotepa, vinorelbine, zidovudine

**Y-site incompatibilities:** Fluconazole, meperidine, sargramostim

## ADVERSE EFFECTS

**CNS:** Fever, somnolence, seizures, confusion, dizziness, weakness, myoclonus, drowsiness
**CV:** Hypotension, palpitations, tachycardia
**GI:** *Diarrhea, nausea, vomiting,* pseudomembranous colitis, hepatitis, glossitis, gastroenteritis, abdominal pain, jaundice
**GU:** Renal toxicity/failure
**HEMA:** Agranulocytosis, eosinophilia, neutropenia, decreased Hgb, Hct
**INTEG:** Rash, urticaria, pruritus, pain at inj site, phlebitis, erythema at inj site, erythema multiforme
**MISC:** Hearing loss, tinnitus, electrolyte abnormalities
**RESP:** Chest discomfort, dyspnea, hyperventilation
**SYST:** Anaphylaxis, Stevens-Johnson syndrome, toxic epidermal necrolysis, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete bioavailability (**IV**) |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, unchanged (70%-80%); breast milk |
| **Half-life** | 1 hr; increased in renal disease |

### Pharmacodynamics

| | IM | IV |
|---|---|---|
| **Onset** | Unknown | Rapid |
| **Peak** | Unknown | 20 min-1 hr |

## INTERACTIONS

### Individual drugs

Aminophylline, cycloSPORINE, ganciclovir, theophylline: increased risk of seizures
Probenecid: increased imipenem plasma levels
Valproic acid: decreased effect of valproic acid

### Drug classifications

β-Lactam antibiotics: increased antagonistic effect

### Drug/lab test

Increased: AST, ALT, LDH, BUN, alkaline phosphatase, bilirubin, creatinine, potassium, chloride
Decreased: sodium
False positive: direct Coombs' test

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for previous penicillin sensitivity reaction or sensitivity to other β-lactams, may have sensitivity to this product
- **Assess patient for signs and symptoms of infection,** including characteristics of wounds, sputum, urine, stool, WBC >10,000/mm$^3$, fever; obtain baseline information before, during treatment
- Complete C&S tests before beginning product therapy to identify if correct treatment has been initiated
- **Seizures:** Product decreases seizure threshold and may decrease effectiveness of seizure medications, monitor closely
- **Assess for allergic reactions, anaphylaxis:** rash, urticaria, pruritus, chills, wheezing, laryngeal edema, fever, joint pain; angioedema may occur a few days after therapy begins; epiNEPHrine, resuscitation equipment should be available for anaphylactic reaction
- Identify urine output; if decreasing, notify prescriber (may indicate nephrotoxicity); also check for increased BUN, creatinine, electrolytes
- Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test monthly if patient is on long-term therapy
- Monitor electrolytes: potassium, sodium, chloride monthly if patient is on long-term therapy
- Assess bowel pattern daily; if severe diarrhea occurs, product should be discontinued; may indicate pseudomembranous colitis
- **Monitor for bleeding:** ecchymosis, bleeding gums, hematuria, stool guaiac daily if patient is on long-term therapy
- Assess for overgrowth of infection: perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excretion unknown

### Patient/family education

- Advise patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
- Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate superinfection
- Advise patient to notify prescriber of diarrhea with blood or pus; may indicate pseudomembranous colitis
- Instruct patient to report seizures immediately

### Evaluation

**Positive therapeutic outcome**

- Absence of signs/symptoms of infection (WBC <10,000/mm$^3$, temp WNL, absence of red, draining wounds)
- Reported improvement in symptoms of infection

**Treatment of anaphylaxis:** EPINEPHrine, antihistamines, resuscitate if needed

## imipramine (Rx)

(im-ip'ra-meen)
**Impril, Novo-Pramine, Tofranil, Tofranil PM**
*Func. class.:* Antidepressant, tricyclic
*Chem. class.:* Dibenzazepine, tertiary amine

**Do not confuse:** imipramine/desipramine

**ACTION:** Blocks reuptake of norepinephrine and serotonin into nerve endings, increasing action of norepinephrine and serotonin in nerve cells; has anticholinergic effects

**Therapeutic outcome:** Decreased symptoms of depression after 2-3 wk; decreased bedwetting in children

## USES:
Depression, enuresis in children

**Unlabeled uses:** Chronic pain, migraine headaches, cluster headaches as adjunct, incontinence

## CONTRAINDICATIONS
Pregnancy, hypersensitivity to this product or carBAMazepine; acute MI

**Precautions:** Suicidal patients, severe depression, increased intraocular pressure, closed-angle glaucoma, urinary retention, cardiac/hepatic disease, hyperthyroidism, electroshock therapy, elective surgery, breastfeeding, geriatric, seizure disorders, prostatic hypertrophy, MI, hypersensitivity to tricyclics, AV block, bundle-branch block, ileus, QT prolongation

**BLACK BOX WARNING:** Children other than for enuresis; suicidal ideation

## DOSAGE AND ROUTES
### Depression
**Adult:** PO 75-100 mg/day in divided doses; may increase by 25-50 mg up to 200 mg, 200 mg/day (outpatients), 300 mg/day (inpatients); may give daily dose at bedtime
**Geriatric:** PO 30-40 mg at bedtime, may increase to 100 mg/day in divided doses
**Child ≥6 yr (unlabeled):** PO 1.5 mg/kg/day in divided doses; max 2.5 mg/kg/day

### Enuresis
**Child 6-12 yr:** PO 10-25 mg at bedtime, max 50 mg

**Available forms:** Tabs 10, 25, 50 mg; caps 75, 100, 125, 150 mg

### Implementation
**PO route**
- Do not break, crush, or chew caps
- Give with food or milk
- Store in tight container at room temp; do not freeze

## ADVERSE EFFECTS
**CNS:** *Dizziness, drowsiness,* confusion, headache, anxiety, tremors, stimulation, weakness, insomnia, nightmares, EPS (geriatric), increased psychiatric symptoms, paresthesia, seizures, ataxia
**CV:** *Orthostatic hypotension, ECG changes, tachycardia,* hypertension, palpitations, dysrhythmias
**EENT:** Blurred vision, tinnitus, mydriasis
**ENDO:** Hyperglycemia, hypothyroidism/hyperthyroidism, goiter, SIADH
**GI:** *Diarrhea, dry mouth,* nausea, vomiting, paralytic ileus, increased appetite, cramps, epigastric distress, jaundice, hepatitis, stomatitis, constipation, taste change, weight gain
**GU:** *Retention,* acute renal failure, impotence, decreased libido
**HEMA:** Agranulocytosis, thrombocytopenia, eosinophilia, leukopenia
**INTEG:** Rash, urticaria, sweating, pruritus, photosensitivity, hyperpigmentation (rare)

### Pharmacokinetics
| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Liver by CYP2D6, extensively |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 8-16 hr |

### Pharmacodynamics
| | PO |
|---|---|
| **Onset** | 1 hr |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS
### Individual drugs
Alcohol: increased effects
CloNIDine: hyperpyretic crisis, seizures, hypertensive episode
CloNIDine, guanethidine: decreased effects
Gatifloxacin, levofloxacin, moxifloxacin, ziprasidone: increased QT interval

### Drug classifications
MAOIs: hyperpyretic crisis, hypertensive episode, seizures
SSRIs, SNRIs, serotonin-receptor agonists: increased serotonin syndrome, increased neuroleptic malignant syndrome; avoid concurrent use
Sympathomimetics (direct acting [EPINEPHrine]), barbiturates, benzodiazepines, CNS depressants: increased effects
Sympathomimetics (indirect acting [ePHEDrine]): decreased effects
Tricyclic antidepressants, class IA/III antidysrhythmics: increased QT interval

### Drug/herb
St. John's wort: serotonin syndrome

### Drug/lab test
Increased: serum bilirubin, blood glucose, alkaline phosphatase, LFTs
Decreased: VMA, 5-HIAA, urinary catecholamines

## NURSING CONSIDERATIONS
### Assessment
- Monitor B/P (with patient lying, standing), pulse q4hr; if systolic B/P drops 20 mm Hg,

hold product, notify prescriber; take vital signs q4hr in patients with CV disease
• Monitor blood studies: CBC, leukocytes, differential, cardiac enzymes if patient is receiving long-term therapy
• Monitor hepatic studies: AST, ALT, bilirubin
• Check weight weekly; appetite may increase with product
• **QT prolongation:** Assess ECG for flattening of T wave, bundle branch block, AV block, dysrhythmias in cardiac patients
• Assess for EPS primarily in geriatric: rigidity, dystonia, akathisia

**BLACK BOX WARNING:** Assess mental status: mood, sensorium, affect, suicidal tendencies especially in children, young adults; increase in psychiatric symptoms: depression, panic

• Monitor urinary retention, constipation; constipation is more likely to occur in children or geriatric
• **Assess for withdrawal symptoms:** headache, nausea, vomiting, muscle pain, weakness, diarrhea, insomnia, restlessness; do not usually occur unless product was discontinued abruptly
• Identify alcohol consumption; if alcohol is consumed, hold dose until AM
• **Beers:** Avoid in older adults, highly anticholinergic, high risk of delirium
• **Pregnancy/breastfeeding:** Use in pregnancy if benefits outweigh fetal risk, do not breastfeed

### Patient/family education

**BLACK BOX WARNING:** Teach patient to report suicidal thoughts, behaviors immediately; more common in children, young adults

• Teach patient that therapeutic effects may take 2-3 wk
• Teach patient to use caution in driving and other activities requiring alertness because of drowsiness, dizziness, blurred vision; to avoid rising quickly from sitting position, especially geriatric; orthostatic hypotension may occur
• Teach patient to avoid alcohol ingestion, other CNS depressants during treatment
• Teach patient not to discontinue medication quickly after long-term use: may cause nausea, headache, malaise
• Teach patient to wear sunscreen or large hat, since photosensitivity occurs
• Teach patient to increase fluids, bulk in diet if constipation, urinary retention occur, especially geriatric
• Teach patient to take gum, hard sugarless candy, frequent sips of water for dry mouth

### Evaluation

**Positive therapeutic outcome**
• Decreased depression
• Absence of suicidal thoughts
• Decreased enuresis in children
• Decreased pain

## TREATMENT OF OVERDOSE:

ECG monitoring, lavage, administer anticonvulsant; sodium bicarbonate (cardiac effects)

## indacaterol

(in-da-kat'er-ol)

**Arcapta Neohaler, Onbrez Breezhal ER**

*Func. class.:* $\beta_2$-agonist, long-acting

I

**ACTION:** An agonist at $\beta_2$-receptors. These receptors are present in large numbers in the lungs and are located on bronchiolar smooth muscle. Stimulation of $\beta_2$-receptors in the lung causes relaxation of bronchial smooth muscle, which produces bronchodilation and an increase in bronchial airflow. These effects may be mediated, in part, by increased activity of adenyl cyclase, an intracellular enzyme responsible for the formation of cyclic-3′,5′-adenosine monophosphate (cAMP); has >24 times greater agonist activity at $\beta_2$-receptors (primarily in the lung) than at $\beta_1$-receptors (primarily in the heart)

**USES:** Bronchitis, chronic obstructive pulmonary disease (COPD), emphysema

## CONTRAINDICATIONS

Acute bronchospasm, acute asthma attack, status asthmaticus, acute respiratory insufficiency, monotherapy of asthma

**Precautions:** Cardiac arrhythmias, congenital long QT syndrome, diabetes mellitus, hypertension, hyperthyroidism (thyrotoxicosis, thyroid disease), hypokalemia, ischemic cardiac disease (coronary artery disease), milk protein hypersensitivity, pheochromocytoma, QT prolongation, seizure disorder, severe hepatic disease, tachycardia, torsades de pointes history, unusual responsiveness to other sympathomimetic amines; not indicated for neonates, infants, children, or adolescents under the age of 18 years, pregnancy, breastfeeding

**BLACK BOX WARNING:** Asthma-related deaths

## DOSAGE AND ROUTES

**Adult:** INH 75 mcg (contents of 1 capsule) inhaled once daily; administer at the same time every day, max 1 dose in 24 hours

### Available forms:
Powder for inhalation: 75 mcg

### Implementation
#### Inhalation route
• For oral inhalation use only; *not* to swallow the capsules; always use the Neohaler inhaler; this inhaler should not be used with any other products; do *not* use with a spacer
• To administer, use dry hands to remove a capsule from the blister pack immediately before use and place into the capsule chamber of the Neohaler inhaler; click the inhaler closed; do not place capsule into the mouthpiece; then, holding upright, depress buttons fully one time to pierce capsule; a click will be heard; have patient breathe out fully away from inhaler; place inhaler in the mouth with lips closed around the mouthpiece and buttons positioned to the left and right (not up and down), then breathe deeply, rapidly, steadily in through the inhaler. A whirring sound should be heard; if no sound is heard, check the chamber—capsule may be stuck. Gently tap the base of the device to loosen capsule if necessary. After inhalation, the patient should hold breath as long as comfortable while removing inhaler from the mouth; check the chamber to see if any powder remains in the capsule; repeat inhalation steps until no powder remains. Most patients can empty the capsule in one or two inhalations. After administration, open the chamber and discard the empty capsule
• The gelatin capsule might break into very small pieces, which can pass through the inhaler screen and reach the mouth. Accidental inhalation or ingestion of these pieces is harmless; piercing the capsule more than once increases the risk of shattering capsule; do not wash inhaler; keep it dry. A clean, dry, lint-free cloth may be used to wipe out the inhaler
• Use the new inhaler provided with each new prescription
• To avoid the spread of infection, do not share the inhaler

## ADVERSE EFFECTS
**CNS:** Headache, tremor
**CV:** Sinus tachycardia, hypertension, QT prolongation and ST-T wave changes, prolonged QTc (an increase of >60 ms from baseline), nonsustained ventricular tachycardia, supraventricular tachycardia (SVT) episodes, intermittent ectopic atrial rhythm
**ENDO:** Hyperglycemia
**GI:** Nausea, dry mouth (xerostomia)
**META:** Hypokalemia
**MS:** Muscle cramps/spasm, musculoskeletal pain
**RESP:** Paradoxical bronchospasm, cough, dyspnea, sputum purulence or volume, wheezing, nasopharyngitis, pneumonia, sinusitis and upper respiratory tract infection

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Steady state 12-15 days protein binding 94%-96% |
| **Metabolism** | By CYP3A4, CYP1A1, CYP2D6, UTG1A1 |
| **Excretion** | Renal 2%-6%, fecally >90% |
| **Half-life** | Terminal 45.5-126 hrs |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 5 min |
| **Peak** | 15 min |
| **Duration** | Unknown |

## INTERACTIONS
### Individual drugs
Amoxapine, some antipsychotics (phenothiazines, pimozide, haloperidol risperiDONE, sertindole ziprasidone), arsenic trioxide, astemizole, bepridil, cisapride, citalopram, chloroquine, clarithromycin, dasatinib, dolasetron, dronedarone, droperidol, erythromycin, flecainide, halofantrine, levomethadyl, maprotiline, methadone, ondansetron, paliperidone, palonosetron, pentamidine, probucol, propafenone, some quinolones (ofloxacin, gatifloxacin, gemifloxacin, grepafloxacin, levofloxacin, moxifloxacin, sparfloxacin), ranolazine, sunitinib, terfenadine, thioridazine, troleandomycin, vorinostat, tetrabenazine: increased QT prolongation
Aminophylline, theophylline: increased hypokalemia
Furazolidone, procarbazine, rasagiline: increased cardiovascular reactions

### Drug classifications
Class IA/III antiarrhythmics, halogenated anesthetics, tricyclic antidepressants: increased QT prolongation
Corticosteroids: increased hypokalemia
MAOIs: increased cardiovascular reactions

## NURSING CONSIDERATIONS
### Assessment
**BLACK BOX WARNING:** Asthma-related death; not to be used in asthma

• **COPD, emphysema, bronchospasm:** Monitor pulmonary function tests

- **QT prolongation:** Monitor ECG, ejection fraction for QT prolongation
- **Paradoxical bronchospasm:** If paradoxical bronchospasm occurs, discontinue this medication immediately, use a short-acting beta-agonist for rescue therapy, as appropriate

### Patient/family education

- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding
- Teach patient/family to report dyspnea, wheezing, bronchospasm
- Teach patient/family not to use with other products unless approved by prescriber; there are many interactions, it is always prescribed with a short-acting beta 2 or steroidal inhaler
- Teach patient how to use neoinhaler, not to stop treatment unless approved by prescriber

**BLACK BOX WARNING:** Not to use for asthma

## indomethacin (Rx)

(in-doe-meth'a-sin)

**Indocin, Nu-Indo, Tivorbex** 🍁

*Func. class.:* NSAID (nonsteroidal antiinflammatory), antirheumatic

*Chem. class.:* Acetic acid derivative

**Do not confuse:** Indocin/Endocet, minocin/Vicodin

**ACTION:** Inhibits prostaglandin synthesis by decreasing enzyme needed for biosynthesis; analgesic, antiinflammatory, antipyretic

**Therapeutic outcome:** Decreased pain, inflammation; closure of patent ductus arteriosus (premature infants)

**USES:** Rheumatoid arthritis, ankylosing spondylitis, osteoarthritis, bursitis, tendinitis, acute gouty arthritis; closure of patent ductus arteriosus in premature infants (**IV**)

## CONTRAINDICATIONS

Pregnancy (3rd trimester) hypersensitivity, asthma, aortic coarctation, bleeding, salicylate/NSAID hypersensitivity, GI bleeding

**BLACK BOX WARNING:** Perioperative pain in CABG

**Precautions:** Pregnancy (1st trimester), breastfeeding, children, bleeding disorders, GI disorders, cardiac disorders, asthma, diabetes, acute bronchospasm, ulcerative colitis, seizures, Parkinson's disease, renal/hepatic disease, depression, neonates

**BLACK BOX WARNING:** Stroke, GI bleeding, MI, those taking NSAIDs are at greater risk of MI and stroke, even in first few weeks of therapy

## DOSAGE AND ROUTES

### Arthritis/antiinflammatory

**Adult:** PO 25-50 mg bid-tid, max 200 mg/day; SUS REL 75 mg daily; may increase to 75 mg bid

### Acute gouty arthritis

**Adult:** PO 50 mg tid; use only for acute attack, then reduce dosage

### Patent ductus arteriosus

Longer or repeated treatment courses may be necessary for very premature infants

**Infant <2 days:** **IV** 0.2 mg/kg, then 0.1 mg/kg × 2 doses at 12, 24 hr

**Infant 2-7 days:** **IV** 0.2 mg/kg, then 0.2 mg/kg × 2 doses at 12, 24 hr

**Infant >7 days:** **IV** 0.2 mg/kg, then 0.25 mg/kg × 2 doses at 12, 24 hr

**Available forms:** Caps 25, 50 mg; sus rel caps 75 mg; oral susp 5 mg/ml; inj 1-mg vials; supp 50 mg

### Implementation

**PO route**

- Swallow sus rel cap whole; do not break, crush, or chew sus rel cap
- Give with food or milk to decrease gastric symptoms and prevent ulceration
- Shake susp; do not mix with other liquids

**Rectal route**

- Have patient retain rect supp for 1 hr after insertion
- Store at room temperature

**IV route**

- Give after diluting 1 mg with 1 or 2 ml saline or sterile water for inj without preservative; give 1 or 0.5 mg/ml, respectively, do not dilute further; give over 5-35 sec to avoid dramatic shift in cerebral blood flow; avoid extravasation
- Hold dose in patent ductus arterious in oliguria <0.6 ml/kg/hr

## ADVERSE EFFECTS

**CNS:** Dizziness, drowsiness, fatigue, confusion, insomnia, anxiety, depression, *headache*

**CV:** Tachycardia, peripheral edema, palpitations, dysrhythmias, hypertension, CV thrombotic events, MI, stroke

**EENT:** Tinnitus, hearing loss, blurred vision

**GI:** *Nausea,* anorexia, *vomiting,* diarrhea, jaundice, cholestatic hepatitis, *constipation,*

flatulence, cramps, dry mouth, peptic ulcer, ulceration, perforation, GI bleeding
**GU:** Nephrotoxicity (dysuria, hematuria, oliguria, azotemia)
**HEMA:** Blood dyscrasias, prolonged bleeding
**INTEG:** Purpura, rash, pruritus, sweating

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO); erratic (RECT); complete (**IV**) |
| **Distribution** | Crosses blood-brain barrier; placenta, 99% plasma protein binding |
| **Metabolism** | Liver, extensively |
| **Excretion** | Breast milk; urine 60%, feces 33% |
| **Half-life** | 1 hr first pass, 2.6-11.2 hr second pass |

### Pharmacodynamics

| | PO | PO–ext rel | IV |
|---|---|---|---|
| **Onset** | 30 min | ½ hr | 2 day |
| **Peak** | 2 hr | Unknown | Unknown |
| **Duration** | 4-6 hr | 4-6 hr | Unknown |

## INTERACTIONS

### Individual drugs

Abciximab, aspirin, clopidogrel, eptifibatide, plicamycin, ticlopidine, tirofiban: increased bleeding risk
Cidofovir, cycloSPORINE, lithium, methotrexate, probenecid: increased toxicity
Digoxin, penicillamine, phentoin: increased effect of each specific product

### Drug classifications

Aminoglycosides: increased effects of aminoglycosides
Anticoagulants, SNRIs, SSRIs, thrombolytics: increased risk of bleeding
Antihypertensives: decreased effect of antihypertensives
Diuretics (potassium sparing): increased hyperkalemia

## NURSING CONSIDERATIONS

### Assessment

- Assess for patent ductus arteriosus: respiratory rate, character, heart sounds
- Assess for joint pain (duration, intensity, ROM), baseline and during treatment
- **Beers:** Avoid use in older adults, more likely to cause CNS effects
- Assess for confusion, mood changes, hallucinations, especially in geriatric
- Assess renal, liver, blood studies: BUN, creatinine, AST, ALT, Hgb before treatment, periodically thereafter; if renal function decreases, do not give subsequent doses

**BLACK BOX WARNING:** Assess for cardiac disease, CV, thrombotic events (MI, stroke) prior to administration, not to be used for perioperative pain in CABG surgery

**BLACK BOX WARNING:** GI bleeding/perforation: chronic use can lead to GI bleeding: use cautiously in those with a history of active GI disease

**BLACK BOX WARNING:** MI, stroke: risk may be greater with longer-term use and in those with CV risk factors

- **Pregnancy/breastfeeding:** Do not use after 30 wk gestation, use only if benefits outweigh fetal risk, <30 wk gestation, do not breastfeed, excreted in breast milk

### Patient/family education

- Advise patient to report change in vision, blurring, rash, tinnitus, black stools
- Tell patient not to use for any other condition than prescribed
- Advise patient to avoid use with OTC medications for pain unless approved by prescriber, to report use to all providers
- Advise patient to avoid hazardous activities, since dizziness or drowsiness can occur
- Instruct patient to use sunscreen to prevent photosensitivity
- Advise to take with food for GI upset
- Teach patient to report signs of GI bleeding: dark stools, hematemesis

**BLACK BOX WARNING:** MI/stroke: Teach patient to immediately report and seek medical attention for signs/symptoms of MI/stroke, discontinue product

### Evaluation

**Positive therapeutic outcome**

- Decreased stiffness
- Increased joint mobility
- Decreased pain

## inFLIXimab (Rx)

(in-fliks'ih-mab)
**Inflectra** 🍁, **Remicade, Remsima** 🍁
*Func. class.:* Antirheumatic (DMRDs), GI antiinflammatory, immunoglobulin
*Chem. class.:* Tumor necrosis factor modifiers

**Do not confuse:** **inFLIXimab**/riTUXimab, **Remicade**/Renacidin

**ACTION:** Monoclonal antibody that neutralizes the activity of tumor necrosis factor α (TNFα) that has been found in Crohn's disease; decreased infiltration of inflammatory cells

**Therapeutic outcome:** Decreased cramping and blood in stools

**USES:** Crohn's disease, fistulizing, moderate to severe; rheumatoid arthritis given with methotrexate, plaque psoriasis, ankylosing spondylitis, ulcerative colitis, psoriatic arthritis, psoriasis

## CONTRAINDICATIONS

Hypersensitivity to murines, moderate to severe HF (NYHA class III/IV)

**Precautions:** Pregnancy, breastfeeding, children, geriatric, COPD, hepatotoxicity, hematologic abnormalities, hepatitis B, Guillain-Barré syndrome, seizures, multiple sclerosis

**BLACK BOX WARNING:** Infection, neoplastic disease, TB

## DOSAGE AND ROUTES

### Crohn's disease (moderate to severe/fistulizing)/ankylosing spondylitis

**Adult/adolescent/child ≥6 yr: IV** INF 5 mg/kg initially, then repeat dose 2, 6 wk, then q8wk; q6wk (ankylosing spondylitis); may increase to 10 mg/kg if needed (adults)

### Ulcerative colitis/plaque psoriasis

**Adult/adolescent/child ≥ 6 yr:** IV infusion 5 mg/kg initially and at 2, 4 wk, then 5 mg/kg q8wk

### Rheumatoid arthritis

**Adult: IV** 3 mg/kg initially, and 2, 6 wk and q8wk thereafter, max 10 mg/kg/dose

**Available forms:** Powder for inj 100 mg

### Implementation

**Intermittent IV infusion route**

- Administer immediately after reconstitution; reconstitute each vial with 10 ml of sterile water for inj, further dilute total dose/250 ml of 0.9% NaCl inj to a total conc of between 0.4 and 4 mg/ml; use 21-G or smaller needle for reconstitution, direct sterile water at glass wall of vial, gently swirl, do not shake, may foam; allow to stand for 5 min, give within 3 hr
- Give over ≥2 hr, use polyethylene-lined inf with in-line, sterile, low-protein-bind filter
- Do not admix
- Provide refrigerated storage, do not freeze

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness, depression, vertigo, fatigue, anxiety, fever,* seizures, *chills, flulike symptoms,* demyelinating disease

**CV:** Chest pain, hypo/hypertension, tachycardia, HF, acute coronary syndrome

**GI:** *Nausea, vomiting, abdominal pain, stomatitis, constipation, dyspepsia, flatulence*

**GU:** Dysuria, frequency

**HEMA:** Anemia, leukopenia, thrombocytopenia, pancytopenia

**INTEG:** *Rash, dermatitis, urticaria,* dry skin, sweating, flushing, hematoma, pruritus, keratoderma blennorrhagicum

**MS:** Myalgia, back pain, arthralgia

**RESP:** URI, pharyngitis, bronchitis, cough, dyspnea, sinusitis

**SYST:** Anaphylaxis, fatal infections, sepsis, malignancies, immunogenicity, Stevens-Johnson syndrome, toxic epidermal necrolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Vascular compartment |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 9½ days |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Drug classifications

Live virus vaccines: do not administer live vaccines concurrently

TNF blockers (abatacept, anakinra, golimumab, rilonacept): increased infections, neutropenia; avoid concurrent use

## NURSING CONSIDERATIONS

### Assessment

- Assess GI symptoms: nausea, vomiting, abdominal pain
- Take periodic blood counts: CBC
- Assess CV status: B/P, pulse, chest pain
- **Assess for allergic reaction, anaphylaxis:** rash, dermatitis, urticaria, fever, chills, dyspnea, hypotension; discontinue if severe; administer epinephrine, corticosteroids, antihistamines; assess for allergy to murine proteins before starting therapy

**BLACK BOX WARNING:** Fatal infections: discontinue if infection occurs, do not administer to patients with active infections; identify TB before beginning treatment, a TB test should be obtained; if present, TB should be treated before giving inFLIXimab; exercise caution when switching one DMARD to another

• Report suspected adverse reactions to the FDA (1-800-FDA-1088)

**BLACK BOX WARNING:** Assess for neoplastic disease in those <18 yr, including hepatosplenic T-cell lymphoma, usually occurs in those with inflammatory bowel disease

• **Pregnancy/breastfeeding:** Does not cross the placenta during first trimester, but does second and third trimester, discontinue 8-10 wk before birth, do not breastfeed

### Patient/family education

• Instruct patient to report infusion reaction immediately
• Instruct patient to notify prescriber immediately if infection occurs
• Advise patient not to breastfeed while taking this product
• Advise patient to notify prescriber of GI symptoms, hypersensitivity reactions
• Advise patient not to operate machinery or drive if dizziness, vertigo occurs
• Teach patient to avoid live virus vaccinations, bring up to date prior to use

### Evaluation

**Positive therapeutic outcome**
• Absence of blood in stool
• Reported improvement in comfort
• Weight gain

**⚠ HIGH ALERT**

## INSULINS

**RAPID ACTING**

**insulin glulisine (Rx)**
**Apidra, Apidra SoloStar**

**insulin aspart (Rx)**
**NovoLOG, NovoLOG Flexpen, NovoLOG PenFill, NovoMix 30 🍁, NovoRapid 🍁**

**insulin (Human)**
**Afreeza**

**insulin lispro (Rx)**
**HumaLOG, HumaLOG U-200 KwikPen**

**SHORT ACTING**

**insulin, regular (OTC)**
**Humulin R 🍁, NovoLIN R, ReliOn R**

**insulin, regular concentrated (Rx)**
**Humulin RU-500**

**INTERMEDIATE ACTING**

**insulin, isophane suspension (NPH) (OTC)**
**Humulin N, NovoLIN ge NPH 🍁, NovoLIN N, NovoLIN N Prefilled, ReliOn N**

**LONG ACTING**

**insulin degludec**
**Tresiba**

**insulin detemir (Rx)**
**Levemir**

**insulin glargine (Rx)**
**Lantus, Toujeo Solostar**

**MIXTURES**

**insulin, isophane suspension and regular insulin (Rx)**
**HumaLIN 70/30, HumaLIN 30/70 🍁, NovoLIN 70/30, NovoLIN 70/30 Prefilled, ReliOn 70/30**

**isophane insulin suspension (NPH) and insulin mixtures (Rx)**
**Humulin 50/50**

**insulin lispro mixture (Rx)**
**HumaLOG KwikPen Mix 50/50, HumaLOG Mix 25 🍁, HumaLOG Mix 50 🍁, HumaLOG Mix 75/25, HumaLOG Mix 50/50**

**insulin aspart mixture (Rx)**
**NovoLOG 70/30, Novolog Mix Flexpen Prefilled Syringe 70/30**

**insulin, inhaled**
(in'soo-lin)
**Afrezza**
*Func. class.:* Antidiabetic, pancreatic hormone
*Chem. class.:* Modified structures of endogenous human insulin

**Do not confuse:** Lantus/lente/Novolog Flexipen/Novolog Humalog

**ACTION:** Decreases blood glucose; by transport of glucose into cells and the conversion of glucose to glycogen, indirectly increases blood pyruvate and lactate, decreases phosphate and potassium; insulin may be human (processed by recombinant DNA technologies)

**Therapeutic outcome:** Decreased blood glucose levels in diabetes mellitus

**USES:** Type 1 diabetes mellitus, type 2 diabetes mellitus, gestational diabetes, insulin lispro may be used in combination with sulfonylureas in children >3 yr

## CONTRAINDICATIONS

Hypersensitivity to protamine; creosol (aspart)

**Precautions:** Pregnancy

## DOSAGE AND ROUTES

### >> Insulin glulisine

**Adult/adolescent/child ≥4 yr:** SUBCUT dosage individualized, give within 15 min before or 20 min after starting a meal

**Adult: IV** dilute to 1 unit/ml in INF systems with 0.9% NaCl, using PVC Viaflex INF bags and PVC tubing, use dedicated line

### >> Insulin aspart

**Adult/adolescent/child ≥6 yr:** Intermittent SUBCUT total daily dose is given as 2-4 inj/day just prior to beginning of a meal; in general, 50%-70% of total daily insulin may be given as insulin aspart, the remainder should be intermediate or long-acting insulin; CONTINUOUS SUBCUT used with external insulin pump via cont SUBCUT insulin INF (CSII), the insulin dose should be based on the insulin dose from the previous regimen

### >> Insulin lispro

**Adult/adolescent/child ≥3 yr:** SUBCUT 15 min before meals; **continuous subcut infusion (external insulin pump)** the total daily dose should be based on the insulin dose in previous regimen, 50% of total dose can be given as meal-related boluses and the remainder as basal infusion

### >> Human regular

**Adult:** SUBCUT ½-1 hr before meals

### Insulin, isophane suspension

**Adult:** SUBCUT dosage individualized by blood, urine glucose; usual dose 7-26 units; may increase by 2-10 units/day if needed

### >> insulin degludec

**Adult:** SUBCUT dose individualized

### >> Insulin detemir

**Adult/adolescent/child ≥2 yr:** SUBCUT 1 or 2 times/day; if 1 time, give with evening meal

### >> Insulin glargine

**Adult and child ≥6 yr:** SUBCUT 10 international units/day, range 2-100 international units/day, but may go much higher

### >> Insulin, inhaled

**Adult:** INH: (type 1) the average initial dose is 0.5-0.6 unit/kg/day, usually ≥ 3 administrations/day; (type 2) the average initial dose is 0.2-0.6 unit/kg/day. When used in combination with oral hypoglycemic agents, may only need a single dose of a longer acting insulin at a dosage of 10 units or 0.2 units/kg/day.

### >> Regular insulin (ketoacidosis)

**Adult: IV** 5-10 units, then 5-10 units/hr until desired response, then switch to SUBCUT dose; **IV**/INF 2-12 units (50 units/500 ml of normal saline)

**Child: IV** 0.1 units/kg

### >> Replacement

**Adult and child:** SUBCUT 0.5-1 units/kg/day qid given 30 min before meals

**Adolescent:** SUBCUT 0.8-1.2 mg/kg/day; this dosage is used during rapid growth

**Available forms: NPH** inj 100 units/ml; **regular** inj 100 units/ml, cartridges 100 units/ml; **insulin analog** inj 100 units/ml; **isophane insulin** inj 100 units/ml, cartridges 100 units/ml; **insulin lispro** 100 units/ml, 1.5-ml cartridges; Humalog KwikPen sol for inj 100 units/ml, Humalog KwikPen 200 units/ml prefilled pen solution for injection; **insulin glulisine** inj 100 units/ml; **insulin glargine** inj 100, 300 units/ml; **insulin degludec** Solution for INJ 100 units/ml (u-100), 200 units/ml (u-200); **insulin detemir** inj 100 units/ml in 10 vials, 3-ml cartridges; **insulin aspart** inj 100 mg/ml (Flexpen, PenFill); **insulin inhaled** 4 units powder for inh

### Implementation

- Store at room temperature for <1 mo (some insulins); keep away from heat and sunlight; refrigerate all other supply; NPH, premixed insulins are cloudy; regular, rapid-acting analogs, long-acting analogs are clear; do not freeze—**IV** route, regular only

**INHALED route**

- Give by inhalation only; use at beginning of a meal (blue cartridge = 4 units of regular insulin, green cartridge = 8 units of regular insulin); multiple cartridges may be needed; for single-use only; inhaler should be discarded after 15 days; store unopened cartridge packages in refrigerator, if not refrigerated, use within 10 days
- Sealed (unopened) blister cards and strips must be used within 10 days. Cartridges left

over in an opened strip must be used within 3 days. Remove a blister card from the foil package. Tear along a perforation to remove one strip. Press the clear side of the strip to push the cartridge out. To load the cartridge, hold the inhaler level in one hand with the white mouthpiece on the top and purple base on the bottom; open the inhaler by lifting the white mouthpiece to a vertical position. Before placing the cartridge in the inhaler, both the cartridge and the inhaler should be at room temperature for 10 minutes. Hold the cartridge with the cup facing down, and line up the cartridge with the opening in the inhaler. The pointed end of the cartridge should line up with the pointed end in the inhaler. The cartridge can be placed into the inhaler; ensure that the cartridge lies flat in the inhaler. Once the cartridge is loaded, keep level.

- Remove the purple mouthpiece cover. Hold the inhaler away from the mouth and fully exhale. While keeping the head level, place the mouthpiece in the mouth and tilt the inhaler down toward the chin. Close lips around the mouthpiece to form a seal. Inhale deeply through the inhaler. Hold breath for as long as is comfortable, and at the same time remove the inhaler from the mouth. Exhale and continue to breathe normally.

**SUBCUT route**

- Give after warming to room temperature by rotating in palms to prevent injecting cold insulin; use only insulin syringes with markings or syringe matching units/ml; rotate inj sites within one area: abdomen, upper back, thighs, upper arm, buttocks; keep record of sites
- Give increased dosages if tolerance occurs
- Premixed insulins and NPH are cloudy suspensions
- Regular human insulin, rapid-acting analogs, and long-acting analogs are clear; do not use if cloudy, thick, or discolored

**CONT SUBCUT route (insulin infusion CSII)**

- Do not mix with other insulins when using a pump
- Insulin lispro 3 ml cartridges are to be used in Disetronic H-TRON plus V100 pump using Disetronic rapid inf sets; the inf set and the cartridge adapter should be changed q3day; replace 3 ml cartridge q6days

**IV route (insulin glulisine only)**

- Dilute to 1 international unit/ml in infusion systems with 0.9% NaCl using PVC viaflex inf bags and PVC tubing; use dedicated line; do not admix

**IV route (regular only)**

- When regular insulin is administered IV, monitor glucose, potassium often to prevent fatal hypoglycemia, hypokalemia
- **IV** direct, undiluted via vein, Y-site, 3-way stopcock; give at 50 units/min or less
- Give by cont inf after diluting with **IV** sol and run at prescribed rate; use **IV** inf pump for correct dosing; give reduced dose at serum glucose level of 250 mg/100 ml

**Additive compatibilities:** Bretylium, cimetidine, lidocaine, meropenem, ranitidine, verapamil

**Additive incompatibilities:** Aminophylline, amobarbital, chlorothiazide, cytarabine, DOBUTamine, PENTobarbital, PHENobarbital, phenytoin, secobarbital, sodium bicarbonate, thiopental

**Y-site compatibilities:** Amiodarone, ampicillin, ampicillin/sulbactam, aztreonam, ceFAZolin, cefoTEtan, DOBUTamine, esmolol, famotidine, gentamicin, heparin, heparin/hydrocortisone, imipenem/cilastatin, indomethacin, magnesium sulfate, meperidine, meropenem, midazolam, morphine, nitroglycerin, oxytocin, PENTobarbital, potassium chloride, propofol, ritodrine, sodium bicarbonate, sodium nitroprusside, tacrolimus, terbutaline, ticarcillin, ticarcillin/clavulanate, tobramycin, vancomycin, vit B/C

**Y-site incompatibilities:** Nafcillin

## ADVERSE EFFECTS

**EENT:** Blurred vision, dry mouth
**INTEG:** Flushing, rash, urticaria, warmth, *lipodystrophy,* lipohypertrophy, swelling, redness
**META:** *Hypoglycemia,* rebound hyperglycemia (Somogyi effect 12-72 hr or longer)
**MISC:** Peripheral edema
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed (SUBCUT) |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver, muscle, kidney |
| **Excretion** | Kidneys |
| **Half-life** | Regular 3-5 min; NPH 10 min |

### Pharmacodynamics

| | |
|---|---|
| **Rapid acting** | |
| Insulin glulisine | Onset 15-30 min, peak ½-1½ hr, duration 3-4 hr |
| Insulin aspart | Onset 10-20 min, peak 1-3 hr, duration 3-5 hr |
| Insulin lispro | Onset 15-30 min, peak ½-1½ hr, duration 3-4 hr |
| **Short acting** | |
| Insulin regular | Onset 30 min, peak 2.5-5 hr, duration up to 6 hr |
| **Intermediate acting** | |
| Insulin, isophane suspension (NPH) | Onset 1.5-4 hr, peak 4-12 hr, duration up to 24 hr |
| **Long acting** | |
| Insulin detemir | Onset 0.8-2 hr, peak unknown, duration up to 24 hr (concentration dependent) |
| Insulin glargine | Onset 1.5 hr, no peak identified, duration ≥ 24 hr |
| Insulin degludec | Peak 12 hr, duration 42 hr after 8 doses |
| **Mixtures** | |
| Insulin, isophane suspension and regular insulin (70/30) | Onset 10-20 hr, peak 2.4 hr, duration up to 24 hr |
| Isophane insulin suspension (NPH) and insulin mixtures (50/50) | Onset ½-1 hr, peak dual, duration 10-16 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased hypoglycemia
DOBUTamine: increased insulin need
EPINEPHrine: decreased hypoglycemia
Sulfinpyrazone, tetracycline: decreased insulin need

### Drug classifications

Anabolic steroids, β-adrenergic blockers, hypoglycemics (oral), salicylates: increased hypoglycemia
Contraceptives (oral), corticosteroids, diuretics (thiazide), thyroid hormones: decreased hypoglycemia
Estrogens: increased insulin need
MAOIs: decreased insulin need

### Drug/lab test

Increased: VMA
Decreased: potassium, calcium
Interference: liver, thyroid function tests

## NURSING CONSIDERATIONS

### Assessment

- Fasting blood glucose, also Hgb A1c may be tested to identify treatment effectiveness q3mo
- Urine ketones during illness; insulin requirements may increase during stress, illness, surgery
- For hypoglycemic reaction that can occur during peak time (sweating, weakness, dizziness, chills, confusion, headache, nausea, rapid weak pulse, fatigue, tachycardia, memory lapses, slurred speech, staggering gait, anxiety, tremors, hunger)
- For hyperglycemia: acetone breath, polyuria, fatigue, polydipsia, flushed, dry skin, lethargy
- **Pregnancy/breastfeeding:** Use if clearly needed, product of choice for pregnancy, monitor blood glucose levels, cautious use in breastfeeding
- **Beers:** Avoid use of short- or rapid-acting insulin in older adults, sliding-scale insulin poses a higher risk of hypoglycemia without improvement in hyperglycemia management

### Patient/family education

- Advise patient that blurred vision occurs; not to change corrective lens until vision is stabilized 1-2 mo
- Advise patient to keep insulin, equipment available at all times; carry a glucagon kit, candy, or lump sugar to treat hypoglycemia
- Inform patient that product does not cure diabetes but controls symptoms
- Advise patient to carry emergency ID as diabetic
- Instruct patient to recognize hypoglycemia reaction: headache, tremors, fatigue, weakness
- Instruct patient to recognize hyperglycemia reaction: frequent urination, thirst, fatigue, hunger

• Teach patient the dosage, route, mixing instructions, any diet restrictions, disease process
• **Teach patient the symptoms of ketoacidosis:** nausea, thirst, polyuria, dry mouth, decreased B/P, dry, flushed skin, acetone breath, drowsiness, Kussmaul respirations
• Advise patient that a plan is necessary for diet, exercise; all food on diet should be eaten; exercise routine should not vary
• Teach patient about blood glucose testing; make sure patient is able to determine glucose level
• Advise patient to avoid OTC products unless directed by prescriber

### Evaluation

**Positive therapeutic outcome**
• Decrease in polyuria, polydipsia, polyphagia; clear sensorium; absence of dizziness; stable gait
• Blood glucose level under control

## TREATMENT OF OVERDOSE:
Glucose 25 g **IV,** via dextrose 50% sol, 50 ml, or glucagon 1 mg

**⚠ HIGH ALERT**
**RARELY USED**

## insulin degludec/liraglutide
(in′su-lin de-gloo′dek/lir′a-gloo′tide)
**Xultophy**
*Func. class.:* Antidiabetic combination

## USES:
Type 2 diabetes mellitus, in combination with diet and exercise, for adults who are inadequately controlled on basal insulin (less than 50 units daily) or liraglutide (less than or equal to 1.8 mg daily)

## CONTRAINDICATIONS
Angioedema, hypoglycemia, medullary thyroid carcinoma (MTC), multiple endocrine neoplasia syndrome type 2 (MEN 2)

## DOSAGE AND ROUTES
**Adult: SUBCUT:** insulin degludec; liraglutide (Xultophy) is given as dose units. The prefilled pen can provide from 10 up to 50 dose units in a single injection in increments of 1 dose unit. Discontinue therapy with liraglutide or basal insulin before initiation of Xultophy. RECOMMENDED STARTING DOSE: 16 dose units (16 units of insulin degludec and 0.58 mg of liraglutide) subcut qday at the same time each day, with or without food. DOSE TITRATION: Titrate the dosage upward or downward by 2 dose units (2 units of insulin degludec and 0.072 mg of liraglutide) q3-4 days based on the metabolic needs, blood glucose monitoring results, and glycemic control goal until the desired fasting plasma glucose is achieved. May temporarily titrate below 16 dose units if needed. However, if the patient requires a dose that is persistently below 16 dose units or requires a dose above 50 dose units, use alternative antidiabetic products. MAX: 50 dose units (50 units insulin de-gludec and 1.8 mg liraglutide)

**⚠ HIGH ALERT**
**RARELY USED**

## insulin glargine/lixisenatide
(in′su-lin glar′gine/lix′i-sen′a-tide)
**Soliqua**
*Func. class.:* Antidiabetic

## USES:
Type 2 diabetes mellitus in combination with diet and exercise in adults inadequately controlled on basal insulin or lixisenatide

## CONTRAINDICATIONS
Angioedema, hypoglycemia

## DOSAGE AND ROUTES
**Adult: SUBCUT:** insulin glargine/lixisenatide (Soliqua) is given as dose units. The prefilled pen can provide from 15 up to 60 dose units in a single injection in increments of 1 dose unit. Discontinue therapy with lixisenatide or basal insulin before initiation of Soliqua. RECOMMENDED STARTING DOSE: In those inadequately controlled on less than 30 units of basal insulin or on lixisenatide, initiate with 15 units (15 units insulin glargine and 5 mcg lixisenatide) subcut qday within the hour before the first meal of the day. In those inadequately controlled on 30-60 units of basal insulin or on lixisenatide, initiate with 30 units (30 units insulin glargine and 10 mcg lixisenatide) subcut qday within the hour before the fi rst meal of the day. TITRATION: Titrate the dosage upward or downward by 2-4 units qwk based on response

## Interferons Beta
## interferon beta-1a (Rx)
(in-ter-feer′on)
**Avonex, Rebif**
## interferon beta-1b (Rx)
**Betaseron, Extavia**
*Func. class.:* Multiple sclerosis agent, immune modifier
*Chem. class.:* Interferon, *Escherichia coli* derivative

## ACTION:
Antiviral, immunoregulatory; action not clearly understood; biologic response-modifying

properties mediated through specific receptors on cells, inducing expression of interferon-induced gene products

**Therapeutic outcome:** Decreased symptoms of multiple sclerosis

**USES:** Ambulatory patients with relapsing or remitting multiple sclerosis

## CONTRAINDICATIONS

Hypersensitivity to natural or recombinant interferon-beta or human albumin, hamster protein, rotavirus vaccine

**Precautions:** Pregnancy, breastfeeding, children <18 yr, chronic progressive multiple sclerosis, depression, mental disorders, seizure disorders, latex allergy, autoimmune disorders, bone marrow suppression, hepatotoxicity, cardiac disease, alcoholism, chickenpox, herpes zoster

## DOSAGE AND ROUTES

### >> Interferon beta-1a

**Remitting-relapsing multiple sclerosis**

**Adult:** IM (Avonex) 30 mcg qwk; SUBCUT (Rebif) 22 or 44 mcg 3 ×/wk with each dose 48 hr apart, titrate to full dose over 4-wk period

### >> Interferon beta-1b

**Relapsing/remitting multiple sclerosis**

**Adult:** SUBCUT 0.0625 mg every other day for wk 1 and 2; then 0.125 mg every other day for wk 3 and 4; then 0.1875 mg every other day for wk 5 and 6; then 0.25 mg every other day thereafter; higher doses should not be used

**Available forms:** Beta-1a (Avonex): 33 mcg (6.6 million international units/vial) (auto-injector pen); (Rebif) 22 mcg, 44 mcg/0.5 ml; beta-1b: powder for inj 0.3 mg (9.6 m international units)

### Implementation

- Reconstitute 0.3 mg (9.6 million international units)/1.2 ml of supplied diluent (0.2 mg or 8 million international units concentration); rotate vial gently, do not shake; withdraw 1 ml using a syringe with 27-G needle; administer SUBCUT only into hip, thigh, arm; discard unused portion

### >> Interferon beta-1a

- Reconstitute with 1.1 ml of diluent, swirl, give within 6 hr
- Store in refrigerator; do not freeze
- Visually inspect parenteral products for particulate matter and discoloration prior to use

**IM route**

- Premedication with acetaminophen or ibuprofen and give at bedtime to lessen flulike symptoms
- Interferon beta-1a (Avonex) 30 mcg is equivalent to 6 million IU
- If a dose is missed, give it as soon as possible; continue the regular schedule but do not give 2 injections within 2 days of each other; all products are for single-use only. Do not re-use needles, syringes, prefilled syringes, or autoinjectors, rotate injection sites
- Check site to minimize injection site reactions
- Do not inject into an area of the body where skin is irritated, reddened, bruised, infected, or scarred
- The injection site should be checked after 2 hours for redness, edema, or tenderness
- The manufacturer of Avonex offers free training on IM use for patients and health care partners. Contact MS ActiveSource for more information (800-456-2255)

**Reconstitution and administration of Avonex lyophilized powder for IM route**

- Use aseptic technique for preparation of solution
- Sites for injection include the thigh or upper arm
- Slowly add 1.1 ml sterile water for injection, preservative-free (supplied by manufacturer) to the vial. Rapid addition of the diluent may cause foaming
- Gently swirl; do not shake. Final concentration should be 30 mcg/ml (6 million IU/ml)
- The solution should be clear to slightly yellow without particles. Discard if the reconstituted product contains particulate matter or is discolored
- Withdraw 1 ml of reconstituted solution into a syringe. Attach the sterile needle and inject IM
- A 25 gauge, 1″ needle for IM may be substituted for the 23 gauge, 1¼″ needle provided
- *Storage:* Use within 6 hours of reconstitution; store reconstituted solution refrigerated; do NOT freeze. Discard any unused solution; both drug and diluent vials are single-use only

**Administration of Avonex prefilled syringe**

- Patients may self-inject only if provider determines that it is appropriate, and with medical follow-up, and after proper training in IM injection technique
- The first injection should be performed under the supervision of an appropriately qualified person
- If self-injecting, rotate between thighs. With help from another person, may rotate between thighs and upper arms

• Wash hands prior to handling the Dose Pack
• Remove prefilled syringe from the refrigerator to warm to room temperature (usually 30 min before use). Do not use external heat sources such as hot water to warm the syringe
• Hold the syringe so the cap is facing down and the 0.5 mL mark is at eye level. Be sure the amount of liquid in the syringe is the same or very close to the 0.5 mL mark. If the correct amount of liquid is not in the syringe, do not use it and call the pharmacist
• Hold syringe upright so that the rubber cap faces up. Remove the cap by bending it at a 90 degree angle until it snaps free
• Attach the needle by pressing it onto the syringe and turning it clockwise until it locks in place. Be careful not to push the plunger while attaching the needle
• Use the alcohol wipe to clean the skin at the injection site you choose. Then, pull the protective cover straight off the needle; do not twist the cover off
• Inject intramuscularly at a 90 degree angle into the thigh or upper arm as directed by the provider
• Use gauze pad to apply pressure for a few seconds after the injection
• Dispose of used needles and syringes in a puncture-resistant container and discard appropriately
• Instruct patients to contact the health care provider if a skin reaction occurs that does not resolve in a few days
• A 25 gauge, 1″ needle for intramuscular injection may be substituted for the 23 gauge, 1¼″ needle provided by the manufacturer, if deemed appropriate by the physician
• Refer to the Patient Medication Guide for detailed instructions for preparing and giving a dose
• *Storage:* Store refrigerated, if refrigeration is unavailable, may store at 77 degrees F or less for up to 7 days; after removal from refrigerator, do not store product above 25 degrees C. If the product has been exposed to conditions other than recommended, discard the product. Do not expose to high temperatures. Do not freeze. Protect from light

**Administration of Avonex prefilled autoinjector**

• Patients may self-inject only if their provider determines that it is appropriate, and with medical follow-up, and after proper training in IM technique
• The first injection should be performed under the supervision of provider
• Remove one Administration Dose Pack from the refrigerator to warm to room temperature (about 30 min before use). Do not use external heat sources such as hot water to warm the syringe Dose Pack
• Wash hands prior to handling Dose Pack contents
• Ensure tamper-evident cap has not been removed or is loose. Then grasp the cap and bend it at a 90-degree angle until it snaps off. Pull off the sterile foil from the needle cover
• Hold the Avonex pen with the glass syringe tip pointing up. Press the needle onto the glass syringe tip. Gently turn the needle clockwise until firmly attached. Do not remove plastic cover from the needle
• Hold Pen with one hand and using other hand, hold onto the injector shield (grooved area) tightly and quickly pull up on the injector shield until the injector shield covers the needle all the way. The plastic needle cover will pop off after the injector shield has been fully extended
• When the injector shield is extended the right way, there will be a small blue rectangular area next to the oval medication display window. Check the display window and make sure the Avonex is clear and colorless
• Do not use the injection if the liquid is colored, cloudy, or has lumps or particles. Air bubbles will not affect your dose
• Do not push down on the injector shield and the blue activation button at the same time until you are ready to give injection
• Avonex pen should be injected into the upper, outer thigh
• Use the alcohol wipe to clean the skin at the injection site you choose and allow it to dry prior to injection
• Hold Pen at 90-degree angle to the injection site. Firmly push the body of the pen down against the thigh to release the safety lock. Safety lock is released when blue rectangle area above the oval medication display window is gone. Push down on blue activation button with thumb and count to 10. You will hear a click if the injection is given the right way
• After counting to 10, pull the pen straight out. Use gauze pad to apply pressure
• The circular display window on the pen will be yellow if you have received the full dose
• Cover exposed needle with pen cover. Do not hold the pen cover with your hands while inserting the needle
• Dispose of used needles and syringes in a puncture-resistant container and discard appropriately
• Instruct patients to contact the health care provider if a skin reaction occurs that does not resolve in a few days

• Refer to the Patient Medication Guide for detailed instructions for preparing and giving a dose
• *Storage:* Store at 36°-46° F (2°-8° C). If refrigeration is unavailable, may store at 77° F (25° C) or less for up to 7 days. After removal from refrigerator, do not store product above 77° F (25° C). If the product has been exposed to conditions other than recommended, discard the product and do not use. Do not expose to high temperatures. Do not freeze. Protect from light

**Subcutaneous administration**

• Give at the same time (preferably late in the afternoon or evening) on the same days of the week at least 48 hr apart
• Do not give on two consecutive days. If a dose is missed, administer the dose as soon as possible then skip the following day. Return to the regular schedule the following week
• Premedication with acetaminophen or ibuprofen may lessen the severity of flulike symptoms
• Interferon beta-1a (Rebif) 44 mcg is equivalent to 12 million IU
• Rotate injection sites. Appropriate injection sites include thigh, outer surface of upper arm, stomach, or buttocks. Do not inject into an area where the skin is irritated, reddened, bruised, or infected
• A "Starter Pack" containing a lower dose of Rebif syringes is available for the initial titration period. Patients and/or caregivers should be trained and understand appropriate preparation and administration
• The manufacturer offers complimentary services including injection training and reimbursement support. Contact MS LifeLines at 877-44-REBIF

**Injection (Rebif)**

• Interferon beta-1a (Rebif) is available in a prefilled syringe with a 29-gauge needle
• Inject subcutaneously into the outer surface of the upper arm, abdomen, thigh, or buttock. Do not inject the area near the navel or waistline. Take care not to inject intradermally
• Discard any unused solution. Prefilled syringes do not contain preservatives and are single-use only

### >> Interferon beta-1b

• Reconstitute by injecting diluent provided (1.2 ml) into vial, swirl (8 milli-international units/ml), use 27-G needle for inj
• Give acetaminophen for fever, headache; use SUBCUT route only; do not give IM or **IV**
• Store reconstituted sol in refrigerator; do not freeze; do not use sol that contains precipitate or is discolored

**Subcut route**

• The manufacturers of Betaseron and of Extavia offer materials to assist with training on subcut use: call 1-800-788-1467 (Betaseron), 1-888-669-6682 (Extavia)
• Premedication with acetaminophen or ibuprofen and use of product at bedtime may lessen the severity of flulike symptoms
• Visually inspect parenteral products for particulate matter and discoloration prior to use. Do not use if particulate matter is present

**Reconstitution**

• Add 1.2 ml of 0.54% sodium chloride injection (supplied by the manufacturer) to the vial by using the vial adapter to attach the prefilled syringe that contains the diluent. Keep the plunger depressed, and gently swirl; do not shake. If you take your thumb off the plunger, the solution may come back into the syringe before the product is fully reconstituted. If foaming occurs, allow the vial to sit until the foam settles; final concentration (250 mcg interferon beta-1b/ml, which corresponds to 8 million International Units/ml)
• If not used immediately, store in the refrigerator for up to 3 hr; do not freeze; discard any unused portion after 3 hr

**Injection**

• Withdraw the desired amount of the reconstituted solution into the syringe by turning the vial and syringe to get the vial on top. Pull the plunger back to get the desired amount of product; turn the syringe to point the needle upward, and tap the syringe and release any air bubbles. Twist the vial adapter to remove it and the vial
• Choose an injection site on the upper, back arms; abdomen; buttocks; or front thighs. Do not inject within 2 in of the navel or in a site where the skin is red, bruised, infected, broken, painful, uneven, or scabbed; rotate injection sites to minimize injection site reactions such as necrosis or localized infection
• Inject subcutaneously. Take care not to inject intradermally

## ADVERSE EFFECTS

**CNS:** *Headache, fever, pain, chills, mental changes,* depression, hypertonia, suicide attempts, seizures
**CV:** *Migraine, palpitations, hypertension,* tachycardia, peripheral vascular disorders
**EENT:** Conjunctivitis, blurred vision
**GI:** *Diarrhea, constipation, vomiting, abdominal pain*
**GU:** *Dysmenorrhea, irregular menses, metrorrhagia,* cystitis, breast pain
**HEMA:** Decreased lymphocytes, ANC, WBC, *lymphadenopathy,* anemia

**INTEG:** *Sweating, inj site reaction*
**MS:** *Myalgia,* myasthenia
**RESP:** *Sinusitis,* dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 50% is absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 8 min-4½ hr (beta-1b), 8.6 hr (beta-1a) |

### Pharmacodynamics

| | Beta-1a | Beta-1b |
|---|---|---|
| **Onset** | Up to 12 hr | Rapid |
| **Peak** | 16 hr | 2-8 hr |
| **Duration** | 4 days | Unknown |

## INTERACTIONS

### Individual drugs

Zidovudine: decreased clearance

### Drug classifications

Antiretrovirals (NNRTIs, NRTIs, protease inhibitors): increased hepatic damage
Antineoplastics: increased myelosuppression

### Drug/herb

Astragalus, echinacea, melatonin: change in immunomodulation

### Drug/lab test

Increased: liver function tests
Interference: vaccines, toxoids; avoid concurrent use

## NURSING CONSIDERATIONS

### Assessment

- Monitor blood, renal, liver function tests: CBC, differential, platelet counts, BUN, creatinine, ALT, urinalysis; if neutrophil count is $<750/mm^3$, or if AST, ALT is 10 × greater than ULN, or if bilirubin is 5 × greater than ULN, discontinue product; when neutrophil count exceeds $750/mm^3$ and liver function or renal studies return to normal, treatment may resume at 50% original dosage
- Assess for CNS symptoms: headache, fatigue, depression; if depression occurs and is severe, product should be discontinued
- Assess for multiple sclerosis symptoms
- Assess mental status: depression, depersonalization, suicidal thoughts, insomnia
- Monitor GI status: diarrhea or constipation, vomiting, abdominal pain
- Monitor cardiac status: increased B/P, tachycardia
- Assess for lupuslike symptoms
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, avoid use in breastfeeding

### Patient/family education

- Provide patient or family member with written, detailed instructions about the product; provide initial and return demonstrations on inj procedure; give information on use and disposal of product
- Inform patient that blurred vision, hearing loss, sweating may occur
- Advise female patients that irregular menses, dysmenorrhea, or metrorrhagia as well as breast pain may occur; use contraception during treatment; product may cause spontaneous abortion
- Teach patient to use sunscreen to prevent photosensitivity
- Instruct patient to notify prescriber if pregnancy is suspected
- Teach patient inj technique and care of equipment
- Instruct patient to notify prescriber of increased temp, chills, muscle soreness, fatigue

### Evaluation

**Positive therapeutic outcome**
- Decreased symptoms of multiple sclerosis

**RARELY USED**

## interferon gamma-1b (Rx)

(in-ter-feer′on)

**Actimmune**

*Func. class.:* Biologic response modifier
*Chem. class.:* Lymphokine, interleukin type

**Therapeutic outcome:** Decreased signs/symptoms of infection (serious) in chronic granulomatous disease

**USES:** Serious infections associated with chronic granulomatous disease, osteopetrosis

**Unlabeled uses:** Osteoporosis, *Mycobacterium avium* complex (MAC), ovarian cancer

## CONTRAINDICATIONS

Hypersensitivity to interferon γ, *Escherichia coli*–derived products

## DOSAGE AND ROUTES

**Adult:** SUBCUT 50 $mcg/m^2$ (1.5 million units/$m^2$) for patient with a surface area of $>0.5\ m^2$; 1.5 mcg/kg/dose for patient with a surface area of $<0.5/m^2$; give on Monday, Wednesday, Friday for 3 ×/wk dosing

**⚠ HIGH ALERT**

# ipilimumab

(ip-i-lim′ue-mab)

**Yervoy**

*Func. class.:* Antineoplastic; biologic response modifier

**ACTION:** A recombinant, human monoclonal antibody that binds to the cytotoxic T-lymphocyte–associated antigen 4 (CTLA-4); action is indirect, possibly through T-cell–mediated antitumor immune responses

**Therapeutic outcome:** Decreased spread of malignant cells

**USES:** Treatment of unresectable or metastatic malignant melanoma

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, Crohn's disease, hepatitis, immunosuppression, inflammatory bowel disease, iritis, ocular disease, organ transplant, pancreatitis, renal disease, rheumatoid arthritis, sarcoidosis, systemic lupus erythematosus, thyroid disease, ulcerative colitis, uveitis

**BLACK BOX WARNING:** Adrenal insufficiency, diarrhea, Guillain-Barre syndrome, hepatic disease, myasthenia gravis, hypo/hyperthyroidism, hypopituitarism, peripheral neuropathy, serious rash, hypophysitis

## DOSAGE AND ROUTES

**Adult and geriatric: IV** 3 mg/kg over 90 min q3wk × 4 doses. Permanently discontinue if the full treatment course is not completed within 16 wk from first dose or for severe or life-threatening adverse reactions; withhold a dose for any moderate endocrine or immune-mediated adverse reactions; if the moderate adverse reaction completely or partially resolves (Grade 0-1) and if the patient is receiving less than 7.5 mg predniSONE or equivalent per day, resume at a dose of 3 mg/kg IV every 3 wk until all 4 planned doses or 16 wk from first dose, whichever occurs earlier; if moderate adverse reactions are persistent or if the corticosteroid dose cannot be reduced to 7.5 mg predniSONE or equivalent per day, permanently discontinue

**Available forms:** Solution for inj 50 mg/10 ml, 200 mg/40 ml

### Implementation

**Intermittent IV infusion route**

- Visually inspect parenteral products for particulate matter and discoloration before using whenever solution and container permit; solution may have a pale yellow color and have translucent-to-white, amorphous particles; discard the vial if the solution is cloudy, if there is pronounced discoloration, or if particulate matter is present
- Allow vials to stand at room temperature for 5 min before infusion preparation; withdraw the required volume and transfer into an IV bag. Discard partially used vials or empty vials; dilute with 0.9% sodium chloride injection, or 5% dextrose injection, to a final concentration (1-2 mg/ml); mix diluted solution by gentle inversion; do not admix
- Give infusion over 90 min through an IV line with a low-protein binding in-line filter, do not give with other products; after each infusion, flush the line with 0.9% sodium chloride Injection, or 0.5% dextrose injection
- Store once diluted, store for no more than 24 hr refrigerated or at room temperature

## ADVERSE EFFECTS

**CNS:** Severe and fatal immune-mediated neuropathies, fatigue, fever, headache
**EENT:** Episcleritis, iritis, Uveitis
**ENDO:** Severe and fatal immune-mediated endocrinopathies
**GI:** Severe and fatal immune-mediated enterocolitis, hepatitis; pancreatitis, abdominal pain, colitis, constipation, decreased appetite, diarrhea, nausea, vomiting
**INTEG:** Severe and fatal immune-mediated dermatitis, pruritus, rash, urticaria
**MISC:** Anemia, cough, dyspnea, eosinophilia, nephritis
**SYST:** Antibody formation, Stevens-Johnson syndrome, toxic epidermal necrolysis

**BLACK BOX WARNING:** Adrenal insufficiency, diarrhea, Guillain-Barré syndrome, hepatic disease, myasthenia gravis, hyperhypothyroidism, hypopituitarism, peripheral neuropathy, serious rash

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Steady state (end of 3rd dose) |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Terminal 15.4 days |

| Pharmacodynamics | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## NURSING CONSIDERATIONS

### Assessment

- **Serious skin disorders:** Stevens-Johnson syndrome, toxic epidermal necrolysis: permanently discontinue in these or rash complicated by full thickness dermal ulceration or necrotic, bullous, or hemorrhagic manifestations like bullous rash; give systemic corticosteroids at a dose of 1-2 mg/kg/day of predniSONE or equivalent; when dermatitis is controlled, taper corticosteroids over a period of at least 1 month. Withhold in those with moderate to severe reactions; for mild to moderate dermatitis (localized rash and pruritus), give topical or systemic corticosteroids

**BLACK BOX WARNING: Immune-mediated reactions:** Assess for enterocolitis, hepatitis, dermatitis, neuropathy, endocrinopathy, before starting treatment, take LFTs, ACTH, and thyroid function tests, permanently discontinue if these occur

- **Hepatotoxicity:** Baseline and before each dose; rule out infectious or malignant causes and increase the frequency of liver function test monitoring until resolution; permanently discontinue in those with Grade 3-5 give systemic corticosteroids at a dose of 1-2 mg/kg/day of prednisone or equivalent
- **Neuropathy:** Monitor for motor or sensory neuropathy (unilateral or bilateral weakness, sensory alterations, or paresthesias) before each dose; permanently discontinue if severe neuropathy (interfering with daily activities) such as Guillain-Barré-like syndromes occur
- **Endocrinopathy:** Monitor thyroid function tests at baseline and before each dose; monitor hypophysitis, adrenal insufficiency, adrenal crisis, hyperthyroidism, hypothyroidism (fatigue, headache, mental status changes, abdominal pain, unusual bowel habits, hypotension, or nonspecific symptoms that may resemble other causes)
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

- Instruct patient/family to report immediately allergic reaction, skin rash, severe abdominal pain, yellowing of skin, eyes; tingling of extremities, change in bowel habits
- Discuss reason for treatment and expected results, to read medication guide
- **Vision changes:** Assess eyes for uveitis, iritis, episcleritis, corticosteroids may be used
- **Pregnancy:** Notify prescriber if pregnancy is planned or suspected, if breastfeeding to use contraception during and for 3 mo after final dose

### Evaluation

**Positive therapeutic outcome**

- Decreasing spread of malignant melanoma

## ipratropium (Rx)

(i-pra-troe'pee-um)

**Atrovent, nasal spray, Atrovent HFA**

*Func. class.:* Anticholinergic, bronchodilator

*Chem. class.:* Synthetic quaternary ammonium compound

**Do not confuse:** Atrovent/Alupent

**ACTION:** Inhibits interaction of acetylcholine at receptor sites on the bronchial smooth muscle, resulting in decreased cyclic guanosine monophosphate (cyclic GMP) and bronchodilatation

**Therapeutic outcome:** Bronchodilatation

**USES:** Bronchospasm, COPD; rhinorrhea (nasal spray)

## CONTRAINDICATIONS

Hypersensitivity to this product, atropine, bromide, soybean, or peanut products

**Precautions:** Pregnancy, breastfeeding, children <12 yr, angioedema, heart failure, surgery, acute bronchospasm, closed-angle glaucoma, prostatic hypertrophy, bladder neck obstruction, urinary retention

## DOSAGE AND ROUTES

### Bronchospasm in chronic bronchitis/emphysema

**Adult:** INH 2 sprays (17 mcg/spray) 3-4×/day, max 12 INH/24 hr, SOL 500 mcg (1 unit dose) given 3-4×/day by nebulizer; nasal spray: 2 sprays (42 mcg/spray) 3-4×/day

**Child 5-12 yr:** NASAL 2 sprays in each nostril 3×/day

### Rhinorrhea perennial rhinitis

**Adult/child ≥6 yr: INTRANASAL** 2 sprays (43 mcg)/nostril bid or tid

**Child 5-12 yr: INTRANASAL** 2 sprays (0.03%) in each nostril 3×/day

**Available forms:** Aerosol 17 mcg/actuation; nasal spray 0.03%, 0.06%; sol for inh 0.0125% ✱, 0.02%

### Implementation

• Give after shaking container; have patient exhale, place mouthpiece in mouth, inhale slowly, hold breath, remove, exhale slowly; allow at least 1 min between inhalations
• Give this medication before other medications and allow at least 5 min between each

**Nebulizer route**

• Use solution in nebulizer with a mouthpiece rather than a face mask

**Intranasal route**

• Prime pump, initially requires 7 actuations of the pump, priming again is not necessary if used regularly; tilt head backward after dose
• Store in light-resistant container; do not expose to temperature over 86° F (30° C)

## ADVERSE EFFECTS

**CNS:** *Anxiety, dizziness, headache,* nervousness
**CV:** Palpitations
**EENT:** Dry mouth, blurred vision, nasal congestion
**GI:** *Nausea, vomiting, cramps*
**INTEG:** Rash
**RESP:** *Cough, worsening of symptoms,* bronchospasm

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Minimal |
| **Distribution** | Does not cross blood-brain barrier |
| **Metabolism** | Liver, minimal |
| **Excretion** | Unknown |
| **Half-life** | 2 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 5-15 min |
| **Peak** | 1-1½ hr |
| **Duration** | 3-6 hr |

## INTERACTIONS

### Individual drugs

Disopyramide: increased anticholinergic action

### Drug classifications

Antihistamines, phenothiazines: increased anticholinergic action
Bronchodilators (other): increased toxicity

### Drug/herb

Belladonna: increased anticholinergic effect
Green tea (large amounts), guarana: increased bronchodilator effect

## NURSING CONSIDERATIONS

### Assessment

• Monitor respiratory function: vital capacity, FEV, ABGs, lung sounds, heart rate, rhythm (baseline, during treatment); if severe bronchospasm is present, a more rapid medication is required
• Monitor for evidence of allergic reactions, paradoxical bronchospasm; withhold dose and notify prescriber; identify if patient is allergic to belladonna products or atropine; allergy to this product may occur
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excretion unknown

### Patient/family education

• Advise patient not to use OTC medications unless approved by prescriber; extra stimulation may occur; to use this medication before other medications and allow at least 5 min between each to prevent overstimulation
• Teach patient that compliance is necessary with number of inhalations/24 hr, or overdose may occur
• Instruct geriatric patients to use spacer device
• Teach patient the proper use of the inhaler; review package insert with patient; to avoid getting aerosol in eyes: blurring may result; to wash inhaler in warm water daily and dry; to avoid smoking, smoke-filled rooms, persons with respiratory tract infections
• Teach patient if paradoxical bronchospasm occurs to stop product immediately and notify prescriber; to limit caffeine products such as chocolate, coffee, tea, and colas
• Instruct patient on administration of dose, not to use more than prescribed; serious side effects may occur; if dose is missed, take when remembered; space other doses on new time schedule; do not double doses
• Use spacer to improve drug use if required

### Evaluation

**Positive therapeutic outcome**

• Absence of dyspnea, wheezing after 1 hr
• Improved airway exchange
• Improved ABGs

## irbesartan (Rx)

(er-be-sar′tan)
**Avapro**
*Func. class.:* Antihypertensive
*Chem. class.:* Angiotensin II receptor (type $AT_1$)

**Do not confuse:** Avapro/Anaprox

**ACTION:** Blocks the vasoconstrictor and aldosterone-secreting effects of angiotensin II; selectively blocks the binding of angiotensin II to the $AT_1$ receptor found in tissues

**Therapeutic outcome:** Decreased B/P

**USES:** Hypertension, alone or in combination, nephropathy in patients with type 2 diabetes mellitus; proteinuria

**Unlabeled uses:** Heart failure

## CONTRAINDICATIONS

Hypersensitivity

**BLACK BOX WARNING:** Pregnancy (2nd/3rd trimesters)

**Precautions:** Pregnancy (1st trimester), breastfeeding, children <6 yr, geriatric, renal/hepatic disease, renal artery stenosis, hypersensitivity to ACE inhibitors, African descent, angioedema

## DOSAGE AND ROUTES

### Hypertension

**Adult:** PO 150 mg/day; may be increased to 300 mg/day; volume-depleted patients: start with 75 mg/day

### Nephropathy in patients with type 2 diabetes mellitus

**Adult:** PO maintenance dose 300 mg/day, start 75 mg/day

**Available forms:** Tabs 75, 150, 300 mg

### Implementation

- Administer without regard to meals
- May be used with other antihypertensives, diuretic

## ADVERSE EFFECTS

**CNS:** Dizziness, anxiety, *headache, fatigue,* syncope
**CV:** Hypotension
**GI:** *Diarrhea, dyspepsia,* hepatitis, cholestasis
**HEMA:** Thrombocytopenia
**MISC:** Edema, chest pain, rash, tachycardia, UTI, angioedema, hyperkalemia
**RESP:** *Cough, upper respiratory infection,* rhinitis, pharyngitis, sinus disorder

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Bound to plasma proteins (90%) |
| **Metabolism** | Liver (minimal) by CYP2C9 |
| **Excretion** | Feces, urine |
| **Half-life** | 11-15 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Drug classifications

CYP2C9 inhibitors (amiodarone, delavirdine, fluconazole, FLUoxetine, fluvastatin, fluvoxaMINE, imatinib, sulfonamides, sulfinpyrazone, voriconazole, zafirlukast): increased irbesartan level
Diuretics (potassium sparing), ACE inhibitors, potassium salt substitutes: increased hyperkalemia
NSAIDs: decreased antihypertensive effect

### Drug/herb

Astragalus, cola tree: increased or decreased antihypertensive effect
Black cohosh, goldenseal, hawthorn, kelp: increased antihypertensive effect
Guarana, khat, licorice, yohimbe: decreased antihypertensive effect

## NURSING CONSIDERATIONS

### Assessment

- Hypotension: For severe hypotension, place in supine position and give IV infusion of NS; drug may be continued after B/P is restored
- Assess B/P, pulse q4hr; note rate, rhythm, quality
- Monitor electrolytes: potassium, sodium, chloride
- Obtain baselines for renal, liver function tests before therapy begins
- Monitor for edema in feet, legs daily
- Assess for skin turgor, dryness of mucous membranes for hydration status
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

- Advise patient to comply with dosage schedule, even if feeling better
- Inform patient that product may cause dizziness, fainting, light-headedness
- Caution patient to rise slowly to sitting or standing position to minimize orthostatic hypotension

**BLACK BOX WARNING:** Advise patient to notify prescriber if pregnancy is suspected; pregnancy (D) 2nd/3rd trimester, (C) 1st trimester

- Teach patient not to stop product abruptly
- Teach patient to take without regard to food

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P

**⚠ HIGH ALERT**

## irinotecan (Rx)

(ear-een-oh-tee'kan)

**Camptosar**

*Func. class.:* Antineoplastic hormone

*Chem. class.:* Topoisomerase inhibitor

**ACTION:** Cytotoxic by producing damage to single-strand DNA during DNA synthesis, binds to topoisomerase I

**Therapeutic outcome:** Prevention in growth of tumor

**USES:** Metastatic carcinoma of colon or rectum, or 1st-line treatment in combination with fluorouracil (5-FU) and leucovorin for metastatic carcinoma of colon or rectum

## CONTRAINDICATIONS

Pregnancy, hypersensitivity

**Precautions:** Breastfeeding, children, geriatric, irradiation, hepatic disease

**BLACK BOX WARNING:** Myelosuppression, diarrhea

## DOSAGE AND ROUTES

**First-line treatment of colorectal cancer in combination with 5-fluorouracil:** IV dosage (with bolus 5-FU/leucovorin)

**Adult: IV** 125 mg/m$^2$ over 90 min followed by leucovorin (20 mg/m$^2$ IV bolus) and then 5-FU (500 mg/m$^2$ IV bolus) on days 1, 8, 15, and 22; the next course begins on day 43 or when toxicity has recovered to NCI grade 1 or less

**Intravenous dosage (with infusional 5-FU/leucovorin)**

**Adult: IV** 180 mg/m$^2$ over 90 min followed by leucovorin (200 mg/m$^2$ IV over 2 hr) then 5-FU bolus and continuous infusion (400 mg/m$^2$ IV bolus, then 600 mg/m$^2$ IV infusion over 22 hr); give days 1, 15, and 29, while leucovorin and 5-FU are given on days 1, 2, 15, 16, 29, and 30; the next course begins on day 43 or when toxicity has recovered to NCI grade 1 or less

**Available forms:** Inj 20 mg/ml

### Implementation

- Use cytotoxic handling precautions

**IV route**

- Premedicate with antiemetic, dexamethasone plus another antiemetic agent, such as a 5-HT$_3$ blocker, given at least 30 min before use
- Prior to beginning a course of therapy, the granulocyte count should be ≥1500, the platelet count ≥100,000 and treatment-related diarrhea should be fully resolved

**Dilution**

- Dilute appropriate dose in $D_5W$ (preferred) or NS injection to a final concentration of 0.12-2.8 mg/ml
- Store up to 24 hr at room temperature and room lighting; because of possible microbial contamination during preparation, an admixture prepared with $D_5W$ or NS should be used within 6 hr; solutions prepared with $D_5W$, refrigerated and protected from light, can be stored for up to 48 hr; avoid refrigeration if prepared with NS

**Intravenous infusion**

- Infuse intravenously over 90 min

**Irinotecan y-site compatibilities:** alemtuzumab, alfentanil, amifostine, amikacin, aminocaproic acid, aminophylline, amiodarone, ampicillin, ampicillin -sulbactam, anidulafungin, argatroban, atenolol, atracurium, azithromycin, aztreonam, bivalirudin, bleomycin, bretylium, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, capreomycin, CARBOplatin, caspofungin, cefazolin, cefoTEtan, cefOXitin, cefTAZidime, ceftazidime (L-arginine), ceftizoxime, cefuroxime, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, cyclophosphamide, cyclosporine, cytarabine, dacarbazine, daptomycin, daunorubicin liposome, daunorubicin, dexamethasone, dexrazoxane, digoxin, diltiazem, diphenhydramine, dobutamine, DOCEtaxel, dolasetron, dopamine, doxacurium, doxorubicin, doxorubicin liposomal, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, foscarnet, gallium, garenoxacin, gatifloxacin, gemtuzumab, gentamicin, granisetron, haloperidol, heparin, hydrALAZINE, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, imipenem-cilastatin, inamrinone, insulin, regular, isoproterenol, ketorolac, labetalol, lepirudin, leucovorin, levofloxacin, levoleucovorin, levorphanol, lidocaine, linezolid, lorazepam, magnesium sulfate,

mannitol, meperidine, meropenem, mesna, metaraminol, methadone, methyldopate, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, minocycline, mitoxantrone, mivacurium, morphine, moxifloxacin, nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, norepinephrine, octreotide, ondansetron, oxaliplatin, PACLitaxel (solvent/surfactant), palonosetron, pancuronium, pantoprazole, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, polymyxin b, potassium acetate/chloride/phosphates, procainamide, prochlorperazine, promethazine e, propranolol, quiNIDine, quinupristin-dalfopristin, raNITIdine, remifentanil, riTUXimab, rocuronium, sodium acetate/bicarbonate/phosphates, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, tacrolimus, teniposide, theophylline, thiotepa, ticarcillin, ticarcillin -clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, trimethobenzamide, vancomycin, vasopressin, vecuronium, verapamil, vinblastine, vinorelbine, voriconazole, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CNS:** Fever, headache, chills, dizziness
**CV:** Vasodilatation, edema, thromboembolism
**GI:** Severe diarrhea, *nausea, vomiting,* anorexia, constipation, cramps, flatus, stomatitis, dyspepsia, hepatotoxicity
**HEMA:** Leukopenia, anemia, neutropenia
**INTEG:** Irritation at site, rash, sweating, alopecia
**MISC:** Asthenia, weight loss, back pain
**RESP:** Dyspnea, increased cough, rhinitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete |
| **Distribution** | Widely, 30%-68% bound to plasma proteins, increased risk of toxicity in those homozygous for UGT1A128 |
| **Metabolism** | Unknown |
| **Excretion** | Urine/bile |
| **Half-life** | 6-12 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual products

CarBAMazepine, PHENobarbital, phenytoin: decreased irinotecan levels
Dexamethasone: increased lymphocytopenia, hyperglycemia
Fluorouracil: increased toxicity
Prochlorperazine: increased akathisia
Radiation: increased myelosuppression, diarrhea

### Drug classifications

Anticoagulants, NSAIDs: increased bleeding risk
Antineoplastics: increased myelosuppression, diarrhea
CYP3A4 inhibitors (ketoconazole): increased irinotecan levels
CYP3A4 inducers (phenytoin, carBAMazepine, PENTobarbital): decreased irinotecan levels
Diuretics: increased dehydration

### Drug/herb

St. John's wort: decreased product level; avoid concurrent use

### Drug/lab test

Increased: ALK phos, AST, LFTs, bilirubin
Decreased: platelets, WBC, neutrophils, Hgb/Hct

## NURSING CONSIDERATIONS

### Assessment

- Assess for CNS symptoms: fever, headache, chills, dizziness

**BLACK BOX WARNING: Myelosuppression:** Assess CBC, differential, platelet count weekly; use colony-stimulating factor if WBC is $<2000/mm^3$, platelet count is $<100,000/mm^3$, Hgb $\leq 9$ g/dl, neutrophils $\leq 1000/mm^3$; notify prescriber of these results, product should be discontinued

- Assess buccal cavity for dryness, sores or ulceration, white patches, oral pain, bleeding, dysphagia

**BLACK BOX WARNING:** Assess GI symptoms: frequency of stools; cramping; severe life-threatening diarrhea may occur with fluid and electrolyte imbalances; treat diarrhea within 24 hr of use with 0.25-1 mg atropine IV; treat diarrhea >24 hr of use with loperamide; diarrhea >24 hr (late diarrhea) can be fatal

- Assess early diarrhea and other cholinergic symptoms, treat with atropine; late diarrhea can be life threatening, must be treated promptly with loperamide
- **Assess signs of dehydration:** rapid respirations, poor skin turgor, decreased urine output; dry skin, restlessness, weakness
- **Assess for bone marrow depression:** bruising, bleeding, blood in stools, urine, sputum, emesis
- **Pregnancy/breastfeeding:** Do not use in pregnancy/ breastfeeding

### Patient/family education

- Advise patient to avoid foods with citric acid or hot or rough texture if stomatitis is present; to drink adequate fluids
- Advise patient to report stomatitis; any bleeding, white spots, ulcerations in mouth; tell patient to examine mouth daily, report symptoms
- Advise patient to report signs of anemia: fatigue, headache, faintness, shortness of breath, irritability, infection, rash
- Advise patient to use contraception during therapy; to report if pregnancy is planned or suspected
- Advise patient to avoid vaccinations while taking this product

**BLACK BOX WARNING:** Instruct patient to report diarrhea that occurs 24 hr after administration; severe dehydration can occur rapidly

- Teach patient to avoid salicylates, NSAIDs, alcohol; bleeding may occur; to avoid all of these products unless approved by prescriber
- Teach patient to report immediately injection site pain, irritation
- Teach patient to report vomiting, dizziness
- Teach patient that regular lab exams will be needed

### Evaluation

**Positive therapeutic outcome**

- Decrease in tumor size, decrease in spread of cancer

## iron, carbonyl

*See ferrous fumarate*

## iron dextran (Rx)

**DexFerrum, InFed, Velphoro**

*Func. class.:* Hematinic

*Chem. class.:* Ferric hydroxide complex with dextran

**Do not confuse:** Imferon/Imuran/Roferon-A/Interferon

**ACTION:** Iron is carried by transferrin to the bone marrow, where it is incorporated into hemoglobin

**Therapeutic outcome:** Prevention and resolution of iron-deficiency anemia

**USES:** Iron-deficiency anemia

### CONTRAINDICATIONS

**BLACK BOX WARNING:** Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, infants <4 mo, children, acute renal disease, asthma, rheumatoid arthritis (**IV**), all anemias excluding iron-deficiency anemia, hepatic/cardiac/renal disease, neonates, ankylosing spondylitis, lupus, hypotension

### DOSAGE AND ROUTES

**Adult and child:** IM 0.5 ml as a test dose by Z-track, then no more than the following total dose including test dose per day:

**Adult/adolescent/child (>15 kg):**

Total iron dextran dose in ml =

$$[0.0442 \times (\text{Desired Hb} - \text{observed Hb}) \times \text{LBW}] + (0.26 \times \text{LBW}),$$

max of undiluted is 100 mg (2 ml)/day

**Child (10-15 kg):**

Total iron dextran dose in ml =

$$[0.0442 \times (\text{Desired Hb} - \text{observed Hb}) \times \text{LBW}] + (0.26 \times \text{ABW}),$$

max of undiluted iron dextran is 100 mg (2 ml)/day

**Child/Infant >4 mo (5-9.9 kg):**

Total iron dextran dose in ml =

$$[0.0442 \times (\text{Desired Hb} - \text{observed Hb}) \times \text{LBW}] + (0.26 \times \text{ABW})$$

**Infants >4 mo (<5 kg):**

Total iron dextran dose in ml =

$$[0.0442 \times (\text{Desired Hb} - \text{observed Hb}) \times \text{LBW}] + (0.26 \times \text{ABW})$$

**Available forms:** Inj IM/**IV** 50 mg/ml (2 ml, 10 ml vials)

### Implementation

**IM route**

- Discontinue oral iron before parenteral; give only after test dose of 25 mg by preferred route; wait at least 1 hr before giving remaining portion
- Give IM inj deep in large muscle mass; use Z-track method and 19-G, 20-G 2-, 3-inch needle; ensure needle is long enough to place product deep in muscle; change needles after withdrawing medication and injecting to prevent skin and tissue staining

**IV route**

- Give **IV** after flushing tubing with 10 ml of 0.9% NaCl; give undiluted; give 1 ml (50 mg) or less over 1 min or more; flush line after use with 10 ml of 0.9% NaCl; patient should remain recumbent for 30-60 min to prevent orthostatic hypotension
- **IV** inj requires single-dose vial without preservative; verify on label **IV** use is approved
- Give by cont inf after diluting in 50-250 ml of 0.9% NaCl for inf; administer over 4-5 hr

- Give only with epinephrine available in case of anaphylactic reaction during dose
- Store at room temperature in cool environment

## ADVERSE EFFECTS

**CNS:** Headache, paresthesia, dizziness, shivering, weakness, seizures
**CV:** Chest pain, shock, hypotension, tachycardia
**GI:** *Nausea,* vomiting, metallic taste, abdominal pain
**HEMA:** Leukocytosis
**INTEG:** Rash, pruritus, urticaria, fever, sweating, chills, brown skin discoloration, pain at inj site, necrosis, sterile abscesses, phlebitis
**MISC:** Anaphylaxis
**RESP:** Dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed; lymphatics over wk or mo |
| **Distribution** | Crosses placenta |
| **Metabolism** | Slow; blood loss, desquamation |
| **Excretion** | Breast milk, feces, urine, bile |
| **Half-life** | 6 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Chloramphenicol: decreased reticulocyte response
Oral iron: do not use together, increased toxicity

### Drug/lab test

False increase: serum bilirubin
False decrease: serum calcium
False positive: $^{99m}$Tc diphosphate bone scan, iron test (large doses >2 ml)

## NURSING CONSIDERATIONS

### Assessment

- Observe for 1 hr after test dose
- Monitor blood studies: Hct, Hgb, reticulocytes, transferrin, plasma iron concentrations, ferritin, total iron-binding bilirubin before treatment, at least monthly

**BLACK BOX WARNING:** Assess for allergic reaction and anaphylaxis; rash, pruritus, fever, chills, wheezing; notify prescriber immediately, keep emergency equipment available

- Assess cardiac status: anginal pain, hypotension, tachycardia
- Assess for nutrition: amount of iron in diet (meat, dark green leafy vegetables, dried fruits, eggs); cause of iron loss or anemia, including salicylates, sulfonamides
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, trace amounts appear in breast milk
- Monitor pulse, B/P during **IV** administration
- Assess for toxicity: nausea, vomiting, diarrhea, fever, abdominal pain (early symptoms); cyanotic lips, nailbeds, seizures, CV collapse (late symptoms)

### Patient/family education

- Caution patient that iron poisoning may occur if increased beyond recommended level; to not take oral iron preparation or vitamins containing iron unless approved by prescriber
- Advise patient that delayed reaction may occur 1-2 days after administration and last 3-4 days (IV) or 3-7 days (IM); report fever, chills, malaise, muscle/joint aches, nausea, vomiting, backache
- Advise patient to avoid breastfeeding
- Advise patient that stools may become dark

### Evaluation

**Positive therapeutic outcome**

- Increased serum iron levels, Hct, Hgb

## TREATMENT OF OVERDOSE:

Discontinue product, treat allergic reaction, give diphenhydrAMINE or EPINEPHrine as needed for anaphylaxis; give iron-chelating product in acute poisoning

## iron polysaccharide

*See ferrous fumarate*

## iron sucrose (Rx)

**Velphro, Venofer**

*Func. class.:* Hematinic
*Chem. class.:* Ferric hydroxide complex with dextran

**ACTION:** Iron is carried by transferrin to the bone marrow, where it is incorporated into hemoglobin

**Therapeutic outcome:** Improved signs/symptoms of iron deficiency anemia; iron levels improved

**USES:** Iron deficiency anemia, hyperphosphatemia in chronic kidney disease on dialysis

## CONTRAINDICATIONS

Hypersensitivity, all anemias excluding iron deficiency anemia, iron overload

**Precautions:** Pregnancy, breastfeeding (**IV**), children, geriatric, abdominal pain, anaphylactic shock, arthralgia, chest pain, cough, diarrhea, dizziness, dyspnea, edema, increased LFTs, fever, headache, heart failure, hyper/ hypotension, infection, MS pain, nausea/vomiting, seizures, weakness

## DOSAGE AND ROUTES

**Adult: IV** 5 ml (100 mg of elemental iron) given during dialysis, most will need 1000 mg of elemental iron over 10 sequential dialysis sessions

### Hyperphosphatemia in chronic kidney disease

**Adult:** PO 500 mg tid

**Available forms:** Inj 20 mg/ml; chew tab 500 mg

### Implementation

- Give only with epinephrine, Solu-MEDROL in case of anaphylactic reaction during dose
- Do not use if particulate is present, or if sol is discolored

**IV route**

- Give directly in dialysis line by slow inj or inf; give by slow inj at 1 ml/min (5 min/vial); inf dilute each vial exclusively in a maximum of 100 ml of 0.9% NaCl, give at rate of 100 mg of iron/15 min, discard unused portions
- Store at room temperature in cool environment, do not freeze
- Do not use with other IV products

## ADVERSE EFFECTS

**CNS:** Headache, dizziness
**CV:** Chest pain, hypo/hypertension, hypervolemia, heart failure
**GI:** *Nausea, vomiting, abdominal pain*
**INTEG:** Rash, pruritus, urticaria, fever, sweating, chills
**MISC:** Anaphylaxis, hyperglycemia
**RESP:** Dyspnea, pneumonia, cough

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Urine |
| **Half-life** | 6 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Chloramphenicol: decreased iron sucrose
Dimercaprol, iron (oral): increased toxicity; do not use together

### Drug/lab test

Increased: glucose

## NURSING CONSIDERATIONS

### Assessment

- Monitor blood studies: Hct, Hgb, reticulocytes, transferrin, plasma iron concentrations, ferritin, total iron binding, bilirubin before treatment, at least monthly
- **Assess for allergy:** anaphylaxis, rash, pruritus, fever, chills, wheezing; notify prescriber immediately, keep emergency equipment available
- Assess cardiac status: hypotension, hypertension, hypervolemia
- **Assess for toxicity:** nausea, vomiting, diarrhea, fever, abdominal pain (early symptoms), cyanotic-looking lips and nailbeds, seizures, CV collapse (late symptoms)
- **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding

### Patient/family education

- Teach patient that iron poisoning may occur if increased beyond recommended level; not to take oral iron preparations
- Teach patient to report itching, rash, chest pain, headache, vertigo, nausea, vomiting, abdominal pain, joint/muscle pain, numbness, tingling

### Evaluation

**Positive therapeutic outcome**

- Increased serum iron levels, Hct, Hgb

## TREATMENT OF OVERDOSE:

Discontinue product, treat allergic reaction, give diphenhydrAMINE or epinephrine as needed, give iron-chelating product in acute poisoning

## isavuconazonium (Rx)

(eye' sa-vue-koe' na-zoe' nee-um)
**Cresemba**
*Func. class.:* Antifungal, systemic
*Chem. class.:* Triazole derivative

**ACTION:** Exerts antifungal activity by inhibiting the synthesis of ergosterol, an essential component of the fungal cell membrane. The depletion of ergosterol within the fungal cell

membrane results in increased cellular permeability causing leakage of cellular content

**Therapeutic outcome:** Decreasing signs, symptoms of infection

## USES:

*Aspergillus flavus, Aspergillus fumigatus, Aspergillus niger, Rhizopus oryzae,* Rucormycetes species; do NOT use for infections of *Candida, Blastomyces, Histoplasma V*

## CONTRAINDICATIONS

Hypersensitivity, short QT syndrome

**Precautions:** Azole hypersensitivity, pregnancy, breastfeeding, infusion-related reactions, hepatic disease

## DOSAGE AND ROUTES

### Invasive aspergillosis and invasive mucormycosis

**Adults: PO** loading dose of 2 caps (372 mg) q8hr X 6 doses. Then, 2 caps (372 mg) qday. Start maintenance dosing 12-24 hr after the last loading dose; **IV** loading dose of 372 mg q8hr X 6 doses, then 372 mg day; then 12-24 hr after the last loading dose give over 1 hr, use a 0.2- to 1.2-micron in-line filter and be administered over a minimum of 1 hr, an additional loading dose is not needed when switching to PO

**Available forms:** Caps 186 mg; powder for inj 382 mg

### Implementation

**PO route**

- Swallow whole, do not chew, crush, dissolve, open the capsules; may be used without regard to food

**IV route**

- Visually inspect for particulate matter and discoloration. The diluted solution may contain translucent to white particulates which will be removed by the in-line filter

**Reconstitution**

- Reconstitute the dry powder with 5 mL sterile water for inj, gently shake until dissolved
- Storage: The reconstituted solution may be stored below 25 degrees C (77 degrees F) for a maximum of 1 hr before further dilution

**Dilution**

- Remove 5 mL of the reconstituted solution and add it to 250 mL of either 0.9% NaCI or $D_5W$ (1.5 mg /mL)
- Gently mix the solution or roll the bag. DO NOT shake. Do not place in a pneumatic transport system
- Apply an in-line filter (0.2-1.2 micron), adhere an in-line filter reminder sticker to the infusion bag
- Give over ≤ 6 hr of dilution
- Storage: May be stored immediately after dilution at 2 to 8 degrees C (36 to 46 degrees F); administration MUST be completed within 24 hr of the time of dilution. Do NOT freeze
- Use product only after C&S confirms organism, product needed to treat condition; make sure product used in life-threatening infections
- Flush IV lines with 0.9% sodium chloride or 5% dextrose in water before and after administration of the infusion
- Must be administered through a 0.2-1.2 micron filter; give over ≥ 1 hr. Do not give by bolus. *Do not admix*

## ADVERSE EFFECTS

**CNS:** *Headache,* paresthesias, peripheral neuropathy, *hallucinations,* depression, insomnia, dizziness, fever, vertigo, tremor, confusion
**CV:** tachypnea, supraventricular tachycardia, atrial fibrillation/flutter
**EENT:** Tinnitus
**GI:** *Nausea, vomiting, anorexia, diarrhea,* cramps, hepatitis, stomatitis
**GU:** *Hypokalemia,* renal failure
**HEMA:** Anemia, eosinophilia, hypomagnesemia, thrombocytopenia, leukopenia
**INTEG:** *Burning, irritation,* pain, necrosis at injection site with extravasation, rash
**MISC:** Cough

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Chinese patients (levels 40% lower), protein binding >99% |
| **Metabolism** | By CYP3A4, CYP3A5, UGT, P-gp, OCT2 enzymes |
| **Excretion** | Eliminated in urine/feces |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2 hrs (**PO**) |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

CycloSPORINE, pimozide, quiNIDine, predniSOLONE, sirolimus, tacrolimus, warfarin, rifabutin, phenytoin: increased effects of each

### Drug classifications

Benzodiazepines, calcium channel blockers, ergots, HMG-CoA reductase inhibitors, sulfonylureas, vinca alkaloids, proton pump inhibitors, NNRTIs, protease inhibitors: increased effects of each
CYP3A4 substrates: increased effect of these
CYP3A4 inhibitors: decreased effect of these

### Drug/herb
• Do not use with St. John's wort

### Drug/lab test
Increased: AST/ALT, alk phos, creatinine, bilirubin
Decreased: Hgb/Hct, platelets, WBC

## NURSING CONSIDERATIONS
### Assessment
• **Pregnancy:** Test for pregnancy before starting treatment, pregnancy, do not breastfeed
• **Short QT syndrome:** Do not use in this condition
• Monitor VS q15-30min during first infusion; note changes in pulse, B/P
• Blood studies: Obtain CBC, potassium, sodium, calcium, magnesium, q2wk
• **Hepatotoxicity:** Identify increasing AST, ALT, alk phos, bilirubin, baseline and periodically
• **Allergic reaction:** Assess for dermatitis, rash; product should be discontinued, antihistamines (mild reaction) or epinephrine (severe reaction) administered
• **Hypokalemia:** Assess for anorexia, drowsiness, weakness, decreased reflexes, dizziness, increased urinary output, increased thirst, paresthesias
• **Ototoxicity:** Assess for tinnitus (ringing, roaring in ears), vertigo

### Patient/family education
• Teach patient that long-term therapy may be needed to clear infection (2 wk-3 mo, depending on type of infection)
• Advise patient to notify prescriber of bleeding, bruising, soft-tissue swelling, dark urine, persistent nausea or diarrhea, headache, rash, yellow skin/eyes
• Women of childbearing age should use effective contraceptive

### Evaluation
• Therapeutic response: Resolution of fungal infection, negative C&S

## isoniazid (Rx)
(eye-soe-nye'a-zid)
**Isotamine**
*Func. class.:* Antitubercular
*Chem. class.:* Isonicotinic acid hydrazide

**ACTION:** Bactericidal interference with lipid, nucleic acid biosynthesis

**Therapeutic outcome:** Resolution of TB infection

**USES:** Treatment, prevention of TB

## CONTRAINDICATIONS
Hypersensitivity

**BLACK BOX WARNING:** Acute liver disease

**Precautions:** Pregnancy, diabetic retinopathy, cataracts, ocular defects, renal disease, **IV** drug users, people >35 yr, postpartum period, HIV, neuropathy

**BLACK BOX WARNING:** Female (African descent, Hispanic), alcoholism

## DOSAGE AND ROUTES
### Treatment
**Adult/adolescent with or without HIV:** PO/IM 5 mg/kg/day up to 300 mg/day or 15 mg/kg 2-3 times per week, max 900 mg 2-3 times per week
**Child and infant HIV positive:** PO/IM 10-15 mg/kg/day; max 300 mg/day

**Available forms:** Tabs 100, 300 mg; inj 100 mg/ml; oral sol 10 mg/ml

### Implementation
• Give antiemetic for vomiting
• Provide a list of foods to avoid while taking this product
**PO route**
• Give with meals to decrease GI symptoms; absorption is better when taken on empty stomach, 1 hr before or 2 hr after meals
**IM route**
• Give inj deep in large muscle mass, massage; rotate inj sites, warm inj to room temperature to dissolve crystals

## ADVERSE EFFECTS
**Hypersensitivity:** Fever, skin eruptions, lymphadenopathy, vasculitis
**CNS:** *Peripheral neuropathy, dizziness,* memory impairment, toxic encephalopathy, seizures, psychosis, slurred speech
**EENT:** Blurred vision, optic neuritis
**GI:** *Nausea, vomiting,* epigastric distress, jaundice, fatal hepatitis
**HEMA:** Agranulocytosis, hemolytic anemia, aplastic anemia, thrombocytopenia, eosinophilia, methemoglobinemia
**MISC:** Dyspnea, vit $B_6$ deficiency, pellagra, hyperglycemia, metabolic acidosis, gynecomastia, rheumatic syndrome, systemic lupus erythematosus–like syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely |
| **Metabolism** | Liver ☠ 50% of patients may metabolize slowly, increasing toxicity; |
| **Excretion** | Kidneys |
| **Half-life** | 1-4 hr (slow acetylators); 0.5-1.5 hr (fast acetylators) |

### Pharmacodynamics

| | PO | IM |
|---|---|---|
| **Onset** | Rapid | Rapid |
| **Peak** | 1-2 hr | 45-60 min |
| **Duration** | 6-8 hr | 6-8 hr |

## INTERACTIONS

### Individual drugs

Alcohol, carBAMazepine, cycloSERINE, ethionamide, meperidine, phenytoin, rifampin, warfarin: increased toxicity

BCG vaccine, ketoconazole: decreased effectiveness

### Drug classifications

Antacids, aluminum: decreased absorption

Benzodiazepines: increased toxicity

SSRIs, SNRIs: increased serotonin syndrome

### Drug/food

Tyramine foods: increased toxicity

### Drug/lab test

Increased: LFTs, bilirubin, glucose

Decreased: platelets, granulocytes

## NURSING CONSIDERATIONS

### Assessment

- Obtain C&S tests, including sputum tests, before treatment; monitor every mo to detect resistance

**BLACK BOX WARNING:** Monitor liver function tests weekly; obtain baseline in all patients, those >35 yr and all women should be monitored periodically; monitor ALT, AST, bilirubin; increased results may indicate hepatitis; renal studies during treatment, monthly: BUN, creatinine, output, specific gravity, urinalysis, uric acid; those with fast acetylation (genetic) may metabolize product more than 5 times faster (Black, Asian, and some Caucasians are at greater risk); fatal hepatitis is a greater risk in Blacks/Hispanics after birth

- ☠ Susceptibility tests before and periodically, half of Mexicans, Blacks, Caucasians, and Indians may be slow acetylators, fast acetylators may be Asians, Eskimos
- **Pregnancy/breastfeeding:** Use during pregnancy even in first trimester for active TB, use only if benefits outweigh fetal risk for other indications, compatible with breastfeeding
- Assess mental status often: affect, mood, behavioral changes; psychosis may occur with hallucinations, confusion
- Assess hepatic status: decreased appetite, jaundice, dark urine, fatigue
- Assess for visual disturbance that may indicate optic neuritis: blurred vision, change in color perception; may lead to blindness

### Patient/family education

- Instruct patient that compliance with dosage schedule for duration is necessary; not to skip or double doses; that scheduled appointments must be kept or relapse may occur
- Caution patient to avoid alcohol while taking product or hepatotoxicity may result; to avoid ingestion of aged cheeses, fish or hypertensive crisis may result; give patient written directions on which foods to avoid while taking this medication
- **Tell patient to report peripheral neuritis:** weakness, tingling/numbness of hands/feet, fatigue; hepatotoxicity: loss of appetite, nausea, vomiting, jaundice of skin or eyes

**BLACK BOX WARNING: Fatal hepatitis:** teach patient to notify prescriber immediately of yellow skin/eyes, dark urine, loss of appetite

### Evaluation

**Positive therapeutic outcome**

- Decreased symptoms of TB
- Culture negative for TB

## TREATMENT OF OVERDOSE:

Pyridoxine

## isosorbide dinitrate (Rx)

(eye-soe-sor'bide)

**Apo-ISDN 🍁, Coradur 🍁, Dilatrate-SR, Isochron, IsoDitrate, Isordil**

## isosorbide mononitrate (Rx)

**Apo-ISMN 🍁, Ismo 🍁**

*Func. class.:* Antianginal, vasodilator

*Chem. class.:* Nitrate

**Do not confuse:** Imdur/Imuran/Inderal/K-Dur

**ACTION:** Relaxation of vascular smooth muscle, which leads to decreased preload, afterload, thus decreasing left ventricular end-diastolic pressure, and systemic vascular resistance and reducing cardiac $O_2$ demand

**Therapeutic outcome:** Relief and prevention of angina pectoris

**USES:** Treatment, prevention of chronic stable angina pectoris

## CONTRAINDICATIONS

Hypersensitivity to this product or nitrates, severe anemia, closed-angle glaucoma

**Precautions:** Pregnancy, breastfeeding, children, orthostatic hypotension, MI, HF, severe renal/hepatic disease, increased ICP, cerebral hemorrhage, acute MI, geriatrics, GI disease, syncope

## DOSAGE AND ROUTES

### Dinitrate

**Adult:** PO 5-20 mg bid-tid, initially, maintenance 10-40 mg bid-tid; SL buccal tab 2.5-5 mg; may repeat q5-10min × 3 doses; ext rel 40-80 mg q8-12hr, max 160 mg/day

### Mononitrate

**Adult:** PO (Monoket) 10-20 mg bid, 7 hr apart; (Imdur) initiate at 30-60 mg/day as a single dose, increase q3day as needed; may increase to 120 mg/day; max 240 mg/day

**Available forms:** Dinitrate: sus rel caps 40 mg; SR tabs 40 mg; tabs 5, 10, 20, 30, 40 mg; SL tabs 2.5, 5 mg; chew tabs 5, 10 mg; mononitrate: tabs (Monoket) 10, 20 mg; ext rel tabs (Imdur) 30, 60, 120 mg

### Implementation

**PO route**

- Swallow sus rel cap and ext rel tab whole; do not break, crush, or chew
- Do not swallow SL tab; tab should be dissolved under tongue
- Chew tab should be chewed thoroughly
- Give 1 hr before or 2 hr after meals with 8 oz of water

**SL route**

- Hold SL tab under tongue until dissolved (a few min); do not take anything PO when SL tab is in place
- Sustained release cap/tab: allow dosing interval >18 hr

## ADVERSE EFFECTS

**CNS:** *Vascular headache, flushing, dizziness,* weakness
**CV:** *Orthostatic hypotension,* tachycardia, collapse, syncope
**GI:** Nausea, vomiting
**INTEG:** Pallor, sweating, rash
**MISC:** Twitching, hemolytic anemia, methemoglobinemia, tolerance, xerostomia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Urine, metabolites |
| **Half-life** | Dinitrate 1 hr, mononitrate 5 hr |

### Pharmacodynamics

| | Sus rel | SL | PO |
|---|---|---|---|
| **Onset** | Up to 4 hr | 2-5 min | 15-30 min |
| **Peak** | Unknown | Unknown | Unknown |
| **Duration** | 5 hr | 2 hr | 5-6 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased hypotension
Rosiglitazone: increased myocardial ischemia; avoid concurrent use
- **Avanafil, Sildenafil, tadalafil, vardenafil:** fatal hypotension, do not use together

### Drug classifications

Antihypertensives, β-adrenergic blockers, calcium channel blockers, diuretics, phenothiazines: increased hypotension
Sympathomimetics: increased heart rate, B/P

## NURSING CONSIDERATIONS

### Assessment

- **Assess for pain:** duration, time started, activity being performed, character, intensity
- **Methemoglobinemia (rare):** assess for cyanosis of lips, nausea/vomiting, coma, shock; usually caused by high dose of product, but may occur with normal dosing
- Monitor for orthostatic B/P, pulse at baseline, during treatment and periodically thereafter
- **Beers:** Use with caution in older adults, may exacerbate episodes of syncope
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excretion unknown

### Patient/family education

- Teach patient that tolerance may occur if taken over long periods; to prevent, allow intervals of 12-14 hr/day without product
- Advise patient to treat headache with OTC analgesics
- Instruct patient to not skip or double doses; if dose is missed take when remembered if 2 hr before next dose (dinitrate), 6 hr before

next dose (sus rel), or 8 hr before next dose (mononitrate)
• Caution patient to avoid alcohol and OTC medications unless approved by prescriber
• Inform patient that product may be taken before stressful activity: exercise, sexual activity
• Advise patient that SL tab may sting mucous membranes
• Caution patient to avoid driving and hazardous activities if dizziness occurs
• Advise patient to comply with complete medical regimen
• Caution patient to make position changes slowly to prevent orthostatic hypotension
• Teach patient not to use with avanafil, sildenafil, tadalafil, vardenafil with nitrates; may cause serious drop in B/P
• Teach patient not to discontinue abruptly; may cause heart attack
• Teach patient to use at beginning of angina symptoms, may repeat every 15 min; if no relief seek medical attention immediately

### Evaluation

**Positive therapeutic outcome**
• Decrease in, prevention of anginal pain

**⚠ HIGH ALERT**

## ixabepilone (Rx)

(ix-ab-ep'i-lone)
**Ixempra**
*Func. class.:* Antineoplastic—miscellaneous
*Chem. class.:* Epothilone

**ACTION:** Microtubule stabilizing agent; microtubules are needed for cell division

**Therapeutic outcome:** Decreased tumor size, decreased spread of malignancy

**USES:** Breast cancer

## CONTRAINDICATIONS

Pregnancy, hypersensitivity to products with polyoxyethylated castor oil, breastfeeding, neutropenia $<1500/mm^3$, thrombocytopenia $<100,000/mm^3$

**BLACK BOX WARNING:** Hepatic disease

**Precautions:** Children, geriatric, alcoholism, bone marrow suppression, cardiac dysrhythmias, cardiac/renal disease, diabetes mellitus, peripheral neuropathy, ventricular dysfunction

## DOSAGE AND ROUTES

### Breast cancer, metastatic or locally advanced given with capecitabine, and resistant to anthracycline, taxane

**Adult: IV** INF 40 mg/$m^2$ over 3 hr q3wk plus capecitabine PO 2000 mg/$m^2$/day in 2 divided doses on days 1-14 q21day; in those with BSA $>2.2$ $m^2$, dose should be calculated for a BSA of 2.2 $m^2$

### Breast cancer, metastatic or locally advanced resistant/refractory to anthracyclines, taxanes, capecitabine

**Adult: IV** INF 40 mg/$m^2$ over 3 hr q3wk; in those with BSA $>2.2$ $m^2$, dose should be calculated for a BSA of 2.2 $m^2$

### Dosage reduction in those taking a strong CYP3A4 inhibitor

**Adult: IV** INF 20 mg/$m^2$ over 3 hr q3wk

**Available forms:** Powder for inj 15, 45 mg

### Implementation

• Premedicate with histamine antagonists 1 hr prior to use, prevents hypersensitivity
• Give antiemetic 30-60 min before giving product and prn

**IV route**
• Let kit stand at room temperature for 30 min; to reconstitute, withdraw supplied diluent (8 ml for 15 mg vials, 23.5 ml for 45 mg vials); slowly inject solution into vial; gently swirl and invert to mix, final conc 2 mg/ml; further dilute in LR in DEHP-free bags; final conc should be 0.2-0.6 mg/ml; after added, mix by manual rotation
• Diluted sol is stable for 6 hr at room temperature; inf must be completed within 6 hr
• Use in-line filter 0.2-1.2 mcm
• Give over 3 hr

## ADVERSE EFFECTS

**CNS:** *Peripheral neuropathy,* chills, fatigue, fever, flushing, headache, insomnia, impaired cognition, asthenia
**CV:** Bradycardia, *hypotension*, abnormal ECG, angina, atrial flutter, cardiomyopathy, chest pain, edema, MI, vasculitis
**GI:** *Nausea, vomiting, diarrhea,* abdominal pain, anorexia, colitis, constipation, gastritis, jaundice, GERD, hepatic failure, trismus
**GU:** Renal failure
**HEMA:** Neutropenia, thrombocytopenia, anemia, infections, coagulopathy
**INTEG:** *Alopecia,* rash, hot flashes
**META:** Hypokalemia, metabolic acidosis
**MS:** *Arthralgia, myalgia*
**RESP:** Bronchospasm, cough, dyspnea

**SYST:** *Hypersensitivity reactions,* anaphylaxis, dehydration, radiation recall reaction

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver by CYP3A4 |
| **Excretion** | Feces 65%, urine 21% |
| **Half-life** | Terminal 52 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Drug classifications

CYP3A4 inducers (aminoglutethimide, barbiturates, bexarotene, bosentan, carBAMazepine, dexamethasone, efavirenz, griseofulvin, modafinil, nafcillin, nevirapine, OXcarbazepine, phenytoin, rifamycin, topiramate): decreased ixabepilone levels

CYP3A4 inhibitors (amiodarone, amprenavir, aprepitant, atazanavir, chloramphenicol, clarithromycin, conivaptan, cycloSPORINE, danazol, darunavir, dalforpristan, delavirdine, diltiazem, erythromycin, estradiol, fluconazole, fluvoxaMINE, fosamprenavir, imatinib, indinavir, isoniazid, itraconazole, ketoconazole, lopinavir, miconazole, nefazodone, nelfinavir, propoxyphene, ritonavir, RU-486, saquinavir, tamoxifen, telithromycin, troleandomycin, verapamil, voriconazole, zafirlukast): increased ixabepilone level

### Drug/herb

St. John's wort: avoid use

### Drug/food

Grapefruit products: avoid use

### Drug/lab test

Increased: LFTs, bilirubin

Decreased: platelets, neutrophils, RBC, potassium

## NURSING CONSIDERATIONS

### Assessment

- Monitor CBC, differential, platelet count prior to therapy, qwk; withhold product if WBC is $<1500/mm^3$ or platelet count is $<100,000/mm^3$, notify prescriber
- Monitor temp q4hr (may indicate beginning infection)

**BLACK BOX WARNING:** Monitor liver function tests before, during therapy (bilirubin, AST, ALT, LDH) prn or qmo; check for jaundiced skin and sclera, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea

- Monitor VS during 1st hr of inf; check IV site for signs of infiltration
- **Cardiac ischemia:** Monitor cardiac function in those with cardiac function that is impaired; chest pain, ECG changes may occur
- Assess for hypersensitive reactions, anaphylaxis including hypotension, dyspnea, angioedema, generalized urticaria; discontinue inf immediately; keep emergency equipment available
- Assess effects of alopecia on body image; discuss feelings about body changes
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

- Teach patient to report signs of infection: fever, sore throat, flulike symptoms
- Teach patient to report signs of anemia: fatigue, headache, faintness, shortness of breath
- Teach patient to report any complaints or side effects to nurse or prescriber
- Caution patient that hair may be lost during treatment; a wig or hairpiece may make patient feel better; new hair may be different in color, texture
- Advise patient that pain in muscles and joints 2-5 days after inf is common
- Advise patient to use nonhormonal type of contraception
- Instruct patient to avoid receiving vaccinations while on this product

### Evaluation

**Positive therapeutic outcome**

- Decreased tumor size, decreased spread of malignancy

ibandronate (Rx)
ibuprofen lysine (Rx)
iloperidone (Rx)
imipramine (Rx)
inFLIXimab (Rx)
insulin (Human)
insulin, regular concentrated (Rx)
insulin detemir (Rx)

isophane insulin suspension (NPH) and insulin mixtures (Rx)
insulin, inhaled
Interferons Beta
interferon gamma-1b (Rx)
irbesartan (Rx)
iron dextran (Rx)
isavuconazonium (Rx)
isosorbide mononitrate (Rx)

ibrutinib
ibutilide (Rx)
imatinib (Rx)
indacaterol
insulin glulisine (Rx)
insulin lispro (Rx)
insulin, isophane suspension (NPH) (OTC)
insulin glargine (Rx)

insulin lispro mixture (Rx)

insulin degludec/liraglutide
interferon beta-1a (Rx)
ipilimumab
irinotecan (Rx)
iron polysaccharide
isoniazid (Rx)
ixabepilone (Rx)

ibuprofen (OTC, Rx)
ifosfamide (Rx)
imipenem/cilastatin (Rx)
indomethacin (Rx)
insulin aspart (Rx)
insulin, regular (OTC)
insulin degludec

insulin, isophane suspension and regular insulin (Rx)
insulin aspart mixture (Rx)

insulin glargine/lixisenatide
interferon beta-1b (Rx)
ipratropium (Rx)
iron, carbonyl
iron sucrose (Rx)
isosorbide dinitrate (Rx)

## ketoconazole topical

*See Appendix B*

## ketoprofen (OTC, Rx)

(ke-to-proe'fen)

**Apo-Keto**

*Func. class.:* NSAID; nonopioid analgesic, antirheumatic

*Chem. class.:* Propionic acid derivative

**ACTION:** Inhibits COX-1, COX-2; analgesic, antiinflammatory, antipyretic

**Therapeutic outcome:** Decreased pain, inflammation

**USES:** Mild to moderate pain; osteoarthritis; rheumatoid arthritis; dysmenorrhea; OTC relief of minor aches, pains

### CONTRAINDICATIONS

Pregnancy, 2nd/3rd trimesters; hypersensitivity to this product, NSAIDs, salicylates

**BLACK BOX WARNING:** Perioperative pain in CABG

**Precautions:** Pregnancy (1st trimester), breastfeeding, children, geriatric, bleeding/GI/cardiac disorders, hypersensitivity to other antiinflammatory agents, asthma, severe renal/hepatic disease, ulcer disease

**BLACK BOX WARNING:** GI bleeding, MI, stroke

### DOSAGE AND ROUTES

#### Rheumatoid arthritis, osteoarthritis

**Adult:** PO 50 mg qid or 75 mg tid, max 300 mg/day or ext rel 200 mg/day

#### Renal dose/hepatic dose

**Adult:** PO GFR <25 ml/min/1.73 $m^2$, albumin <3.5 g/dl, decreased hepatic function, or ESRD, max 100 mg qday

#### Analgesic

**Adult:** PO 25-50 mg q6-8hr, max 300 mg/day

**Available forms:** Caps 50, 75 mg; ext rel caps 200 mg

#### Implementation

- Store at room temperature
- Give with antacids, milk, or food for GI upset
- Swallow whole; do not break, crush, chew, or open ext rel cap
- Give with 8 oz of water and sit upright for 30 min after dose to prevent ulceration
- Give with a full glass of water 2 hr after meals
- Give with food or milk to decrease gastric symptoms; give 30 min before or 2 hr after meals; absorption may be slowed

### ADVERSE EFFECTS

**CNS:** Dizziness, drowsiness, fatigue, confusion, insomnia, depression, headache

**CV:** Tachycardia, peripheral edema, palpitations, dysrhythmias, hypertension, CV thrombotic events, MI, stroke

**EENT:** Tinnitus, hearing loss, blurred vision

**GI:** *Nausea, anorexia, vomiting, diarrhea,* jaundice, hepatitis, constipation, flatulence, cramps, dry mouth, peptic ulcer, GI bleeding, *dyspepsia*

**GU:** Nephrotoxicity: dysuria, hematuria, oliguria, azotemia

**HEMA:** Blood dyscrasias

**INTEG:** Purpura, rash, pruritus, sweating

**SYST:** Anaphylaxis, exfoliative dermatitis Stevens-Johnson syndrome, toxic epidermal necrosis

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Not known |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | 2-4 hr; 5.4 hr (ext rel) |

#### Pharmacodynamics

| | |
|---|---|
| **Onset** | Onset 2-3 hr<br>Peak 7 hr |
| **Peak** | 1-2 hr; 1-2 hr (ext rel) |
| **Duration** | Unknown |

### INTERACTIONS

#### Individual drugs

Alcohol, cidofovir: increased adverse GI reactions, toxicity

Aspirin: increased ketoprofen levels, increased adverse GI reactions

Clopidogrel, eptifibatide, ticlopidine, tirofiban: increased risk of bleeding

CycloSPORINE, lithium, methotrexate, phenytoin: increased ketoprofen levels, increased toxicity

Insulin: increased hypoglycemia

Probenecid: increased ketoconazole levels

#### Drug classifications

Anticoagulants, thrombolytics: increased risk of bleeding

Antihypertensives: decreased effect of antihypertensives

Antineoplastics: increased hematologic toxicity
Corticosteroids: increased adverse GI reactions
Diuretics: decreased effectiveness of diuretics
NSAIDs: increased adverse GI reactions
Sulfonylureas: increased hypoglycemia

### Drug/herb

Feverfew, Dong quai, garlic, ginger, ginkgo, horse chestnut, ginseng *(Panax)*: increased risk of bleeding

### Drug/lab test

Increased: bleeding time, BUN, alkaline phosphatase, AST, ALT, creatinine, LDH

## NURSING CONSIDERATIONS

### Assessment

- **Assess for pain:** type, location, intensity; ROM before and 1-2 hr after treatment
- Monitor renal, liver function tests: AST, ALT, bilirubin, creatinine, BUN, urine creatinine, CBC Hct, Hgb, pro-time if patient is on long-term therapy and q6mo
- Check I&O ratio; decreasing output may indicate renal failure (long-term therapy)
- **Assess hepatotoxicity:** dark urine, clay-colored stools, jaundice of skin and sclera, itching, abdominal pain, fever, diarrhea if patient is on long-term therapy
- Assess for allergic reactions: rash, urticaria; if these occur, product may have to be discontinued
- Assess for ototoxicity: tinnitus, ringing, roaring in ears; audiometric testing needed before, after long-term therapy
- Assess for vision changes: blurring, halos; may indicate corneal, retinal damage
- Check edema in feet, ankles, legs
- Identify prior product history; there are many product interactions

**BLACK BOX WARNING:** Assess for CV thrombotic events: MI, stroke, this product or other NSAIDs may increase, the risk

**BLACK BOX WARNING:** For GI bleeding: blood in sputum, emesis, stools

- **Beers:** Avoid chronic use in older adults unless other alternatives are not available, increased risk of GI bleeding, peptic ulcer disease

### Patient/family education

- Teach patient to report any symptoms of hepatotoxicity, renal toxicity, vision changes, ototoxicity, allergic reactions, bleeding (long-term therapy)
- Advise patient to take with 8 oz of water and sit upright for 30 min after dose to prevent ulceration, not to crush or chew ext rel products
- Caution patient not to exceed recommended dosage, acute poisoning may result; to take as prescribed; do not double dose
- Advise patient to read label on other OTC products; many contain other antiinflammatories
- Advise patient to use sunscreen, protective clothing to prevent photosensitivity
- Inform patient that the therapeutic response takes 2 wk (arthritis)
- Teach patient to report tinnitus, confusion, diarrhea, sweating, hyperventilation, blurred vision, fever, joint aches
- Caution patient to avoid alcohol ingestion; GI bleeding may occur
- Teach patient to report use to all providers
- Teach patient to report immediately rash, itching
- **Pregnancy, breastfeeding:** Teach patient to report planned or suspected; avoid breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Decreased pain
- Decreased inflammation
- Increased mobility
- Decreased fever



## ketorolac (systemic, nasal) (Rx)

(kee'toe-role-ak)

**Acular, Sprix, Toradol** 🍁

*Func. class.:* Nonsteroidal antiinflammatory (NSAID), nonopioid analgesic

*Chem. class.:* Acetic acid

**ACTION:** Inhibits prostaglandin synthesis by decreasing an enzyme needed for biosynthesis; analgesic, antiinflammatory, antipyretic effects

**Therapeutic outcome:** Decreased pain, inflammation, ocular itching

**USES:** Mild to moderate pain (short term); decreased ocular itching in seasonal allergic conjunctivitis (ophthalmic)

## CONTRAINDICATIONS

Pregnancy (3rd trimester), hypersensitivity, asthma, hepatic disease, peptic ulcer disease, CV bleeding

**BLACK BOX WARNING:** Breastfeeding, severe renal disease, labor and delivery, perioperative pain in CABG, prior to major surgery, epidural/intrathecal administration, GI bleeding, hypovolemia

**Precautions:** Pregnancy, GI/cardiac disorders, hypersensitivity to other antiinflammatory agents, CCr <25 ml/min

**BLACK BOX WARNING:** Children, geriatric, bleeding, MI, stroke

## DOSAGE AND ROUTES

**Adult/adolescent >17 yr and ≥50 kg: PO** continuation from **IM/IV** only 20 mg, then 10 mg q4-6hr prn, max 40 mg/day; nasal 1 spray (15.75 mg/spray) in each nostril (31.5 mg/spray) q6-8hr, max 4 doses/day × 5 days

**Adult/adolescent >17 yr and <50 kg: IM** (single dose) 30-60 mg, **IV** 15-30 mg; **IM/IV** (multiple dosing) 15-30 mg q6hr, max 60 mg/day × 5 day combined either **PO/IM/IV;** nasal 1 spray (15.75 mg/spray) in one nostril q6-8hr, max 4 doses/day × 5 days

### Renal dose

Do not use in advanced renal disease

### Ophthalmic route

**Adult:** 1 gtt (0.25 mg) qid × 7 days
**Child: IV** 1 mg/kg, then 0.5 mg/kg q6hr

**Available forms:** Inj 15, 30 mg/ml (prefilled syringes); ophth 0.5% sol; tabs 10 mg; nasal spray 15.75 mg/spray

### Implementation

**PO route**

- Administer to patient crushed or whole
- Max 5 days
- Give with full glass of water; give with food or milk to decrease gastric symptoms; give 30 min before or 2 hr after meals; absorption may be slowed

**Nasal route**

- Prime pump before using for the first time, point away from person/pets, pump activator 5 times, no need to re-prime
- For single use only, discard 24 hr after opening if not used
- Do not share with others
- Have patient blow nose, sit upright to spray

**IM/IV route**

- **IV** give undiluted ≥15 sec
- Give IM inj deeply into large muscle mass
- Store at room temperature, protect from light

**Y-site compatibilities:** Cisatracurium, remifentanil, SUFentanil

**Syringe incompatibilities:** Morphine, meperidine, promethazine, hydrOXYzine

**Solution compatibilities:** $D_5W$, 0.9% NaCl, LR, $D_5$, plasmalyte

## ADVERSE EFFECTS

**CNS:** Dizziness, *drowsiness,* tremors, seizures
**CV:** Hypertension, flushing, syncope, pallor, edema, vasodilatation, CV thrombotic events, MI, stroke
**EENT:** Tinnitus, hearing loss, blurred vision, transient burning/stinging
**GI:** Nausea, anorexia, vomiting, diarrhea, constipation, flatulence, cramps, dry mouth, peptic ulcer, GI bleeding, perforation, taste change, hepatitis, hepatic failure
**GU:** Nephrotoxicity: dysuria, hematuria, oliguria, azotemia
**HEMA:** Blood dyscrasias, prolonged bleeding
**INTEG:** Purpura, rash, pruritus, sweating, angioedema, Stevens-Johnson syndrome, toxic epidermal necrolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly, completely absorbed |
| **Distribution** | Bound to plasma proteins (99%) |
| **Metabolism** | Liver (<50%) |
| **Excretion** | Kidney, metabolites (92%); breast milk (6%); feces |
| **Half-life** | 6 hr (IM); increased in renal disease |

### Pharmacodynamics

| | IM | Ophth/PO |
|---|---|---|
| **Onset** | Up to 10 min | Unknown |
| **Peak** | 50 min IM; 2-3 hr PO; 0.5-2 hr nasal | Unknown; 6-8 hr nasal |
| **Duration** | 4-6 hr PO | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol, aspirin: increased GI effects
Aspirin: increased ketorolac levels, contraindicated
Cefamandole, cefoperazone, cefoTEtan, clopidogrel, eptifibatide, plicamycin, ticlopidine, tirofiban, valproic acid: increased risk of bleeding
CycloSPORINE, lithium, methotrexate, pentoxifylline, probenecid: increased toxicity

### Drug classifications

ACE inhibitors: increased renal impairment
Anticoagulants: increased effects

Antihypertensives: decreased antihypertensive effect
Salicylates, SNRIs, SSRIs, thrombolytics: increased risk of bleeding
Corticosteroids, NSAIDs, potassium products, steroids: increased GI effects
Diuretics: decreased diuretic effect
NSAIDs (other): increased ketorolac levels; contraindicated

### Drug/lab test

Increased: AST, ALT, LDH, bleeding time

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Monitor renal, hepatic, blood studies: BUN, creatinine, AST, ALT, Hgb before treatment, periodically thereafter, check for dehydration

- **Monitor for aspirin sensitivity,** asthma; these patients may be more likely to develop hypersensitivity to NSAIDs
- Assess patient's eyes: redness, swelling, tearing, itching
- **Monitor for pain:** type, location, intensity, ROM before and 1 hr after treatment
- Assess for CV thrombotic events: MI, stroke; do not use for perioperative pain in CABG

**BLACK BOX WARNING:** Assess for GI bleeding: blood in sputum, emesis, stools

**BLACK BOX WARNING:** Do not use epidurally, intrathecally; alcohol is present in the solution

- **Pregnancy/breastfeeding:** Teach patient to report if pregnancy is planned or suspected, not to breastfeed
- **Beers:** Avoid in older adults, increased risk of GI bleeding/peptic ulcer disease

### Patient/family education

- Teach patient that product must be continued for prescribed time to be effective; to avoid aspirin, alcoholic beverages, other NSAIDs, acetaminophen
- Caution patient to report bleeding, bruising, fatigue, malaise, since blood dyscrasias do occur
- Instruct patient to use caution when driving; drowsiness, dizziness may occur
- Instruct patient to take with a full glass of water to enhance absorption
- Caution patient that this product may cause eye redness, burning if soft contact lenses are worn
- Advise to report use to all health care providers, not to use with other products unless approved by prescriber; use for ≤5 days
- Instruct patient to report change in urine pattern, weight increase, edema; pain in joints, fever, blood in urine (indicates nephrotoxicity); bruising, black tarry stools (indicates bleeding)
- Caution patient not to breastfeed
- Instruct patient to report if pregnancy is planned or suspected, pregnancy (C) systemic
- **Nasal:** Instruct patient to discard within 24 hr of opening; may cause irritation; may drink water after dose

**BLACK BOX WARNING:** Instruct patient to report change in urine pattern, weight increase, edema, increased joint pain, fever, blood in urine (indicates nephrotoxicity); bruising, black tarry stools (indicates bleeding); pruritus, jaundice, nausea, right upper quadrant pain, abdominal pain (hepatotoxicity); to notify prescriber immediately

### Evaluation

**Positive therapeutic outcome**

- Decreased pain
- Decreased inflammatory response
- Increased mobility
- Decreased ocular itching

**ketorolac ophthalmic**
*See Appendix B*

**ketotifen ophthalmic**
*See Appendix B*

ketoconazole topical
ketorolac ophthalmic
ketoprofen (OTC, Rx)
ketotifen ophthalmic
ketorolac (systemic, nasal) (Rx)

**⚠ HIGH ALERT**

## labetalol (Rx)

(la-bet'a-lole)

**Trandate**

*Func. class.:* Antihypertensive, antianginal

*Chem. class.:* α- and β-blocker

**Do not confuse:** Trandate/Tridate

**ACTION:** Produces decreases in B/P without reflex tachycardia or significant reduction in heart rate through mixture of α-blocking, β-blocking effects; elevated plasma resins are reduced

**Therapeutic outcome:** Decreased B/P

**USES:** Mild to moderate hypertension; treatment of severe hypertension (**IV**), hypertensive emergency in pregnancy, subarachnoid hemorrage

**Unlabeled uses:** Hypertension in patients with pheochromocytoma, hypertension in clonidine withdrawal

## CONTRAINDICATIONS

Hypersensitivity to β-blockers, cardiogenic shock, heart block (2nd or 3rd degree), sinus bradycardia, HF, bronchial asthma

**Precautions:** Pregnancy breastfeeding, geriatric, major surgery, diabetes mellitus, thyroid/renal/hepatic disease, COPD, well-compensated heart failure, CAD, nonallergic bronchospasm, peripheral vascular disease

**BLACK BOX WARNING:** Abrupt discontinuation

## DOSAGE AND ROUTES

### Hypertension

**Adult:** PO outpatient 100 mg bid; may be given with diuretic; may increase to 200 mg bid after 2 days; may continue to increase q1-3 days; max 2400 mg/day in divided doses; inpatient 200 mg then 200-400 mg in 6-12 hr, depends on response; may increase by 200 mg bid at 1-day intervals

**Child/adolescent (unlabeled):** PO 1-3 mg/kg/day, titrate to max 10-12 mg/kg/day based on B/P; IV 0.2-1 mg/kg over 2 min, max 40 mg/dose; IV INF 0.25-3 mg/kg/hr

### Hypertensive crisis

**Adult:** IV direct 20 mg over 2 min; may repeat 20-80 mg over 2 min q10min, max 300 mg; IV Cont INF after loading dose give 1-2 mg/min until desired response or max 300 mg

**Available forms:** Tabs 100, 200, 300 mg; INJ 5 mg/ml, 20-, 40-ml vials

### Implementation

- Store in dry area at room temp; do not freeze

**PO route**

- Give before meals, at bedtime; tab may be crushed or swallowed whole; give with food to prevent GI upset, increase absorption
- Do not discontinue prior to surgery
- Store protected from light, moisture; place in cool environment
- When discontinuing IV and starting PO when B/P rises start at 200 mg, then 200-400 mg in 6-12 hr, adjust as needed
- Take apical pulse before use; if <50 bpm, withhold; notify prescriber

**Direct IV route**

- Give undiluted (5 mg/ml) over 2 min

**Continuous IV infusion route**

- Give after diluting in LR, $D_5W$, $D_5$ in 0.2%, 0.9%, 0.33% NaCl or Ringer's; infusion is titrated to patient's response; 200 mg of product/160 ml sol (1 mg/ml); 300 mg of product/240 ml sol (1 mg/ml); 200 mg of product/250 ml sol (2 mg/3 ml); use inf pump
- Keep patient recumbent during and for 3 hr after inf, monitor VS q5-15min q10min as needed

**Y-site compatibilities:** Alemtuzumab, alfentanil, amikacin, aminocaproic acid, aminophylline, amiodarone, anidulafungin, argatroban, arsenic trioxide, ascorbic acid injection, atracurium, atropine, azithromycin, aztreonam, benztropine, bivalirudin, bleomycin, bretylium, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, carmustine, caspofungin, ceFAZolin, cefotaxime, cefoTEtan, cefOXitin, ceftaroline, cefTAZidime, ceftizoxime, chlorproMAZINE, cimetidine, CISplatin, cloNIDine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, DAUNOrubicin liposome, dexmedetomidine, dexrazoxane, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doripenem, doxacurium, DOXOrubicin, DOXOrubicin liposomal, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, epoetin alfa, eptifibatide, ertapenem, erythromycin lactobionate, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, folic acid, gallium, ganciclovir, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, HYDROmorphone, hydroxyzine, IDArubicin, ifosfamide, imipenem-cilastatin, inamrinone, irinotecan, isoproterenol, lactated Ringer's injection, lepirudin, leucovorin, levofloxacin, lidocaine, linezolid injection, LORazepam, magnesium sulfate,

mannitol, mechlorethamine, meperidine, metaraminol, methyldopate, methyl-PREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, minocycline, mitoXANtrone, morphine, moxifloxacin, multiple vitamins injection, mycophenolate, nalbuphine, naloxone, netilmicin, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, palonosetron, pamidronate, pancuronium, papaverine, PEMEtrexed, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, phytonadione, polymyxin B, potassium acetate/chloride/phosphates, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, pyridoxine, quiNIDine, quinupristin-dalfopristin, ranitidine, Ringer's injection, rocuronium, sodium acetate/bicarbonate, succinylcholine, SUFentanil, tacrolimus, telavancin, teniposide, theophylline, thiamine, thiotepa, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, voriconazole, zoledronic acid

**Y-site incompatibilities:** Cefoperazone, nafcillin

## ADVERSE EFFECTS

**CNS:** *Dizziness,* mental changes, drowsiness, *fatigue,* headache, catatonia, depression, anxiety, nightmares, paresthesias, lethargy

**CV:** *Orthostatic hypotension,* bradycardia, HF, chest pain, ventricular dysrhythmias, AV block, scalp tingling

**EENT:** *Tinnitus,* vision changes, sore throat, double vision, dry burning eyes, floppy iris syndrome, nasal congestion

**ENDO:** Hyperkalemia

**GI:** *Nausea, vomiting, diarrhea,* dyspepsia, taste distortion, hepatotoxicity

**GU:** Impotence, dysuria, ejaculatory failure

**HEMA:** Agranulocytosis, thrombocytopenia, purpura (rare)

**INTEG:** Rash, alopecia, urticaria, pruritus, fever, exfoliative dermatitis

**RESP:** Bronchospasm, dyspnea, wheezing

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Bioavailability 25% (PO); complete (**IV**) |
| **Distribution** | Crosses placenta, CNS |
| **Metabolism** | Liver, extensively |
| **Excretion** | Breast milk, kidneys, bile |
| **Half-life** | 6-8 hr |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | 30 min | 2-5 min |
| **Peak** | 1 hr | 5-15 min |
| **Duration** | 24 hr | 2-4 hr |

## INTERACTIONS

### Individual drugs

Alcohol (large amounts), cimetidine, nitroglycerin: increased hypotension

Lidocaine: decreased effect

Verapamil: increased myocardial depression

### Drug classifications

Antidepressants, tricyclics: increased tremor

Antidiabetics: increased or decreased effect, monitor blood glucose

Antihypertensives: increased hypotension

β-Blockers, bronchodilators, sympathomimetics, xanthines: decreased effects

Diuretics: increased hypotension

General anesthetics, hydantoins, class IC antidysrhythmics: increased myocardial depression

MAOIs: do not use within 2 wk

NSAIDs, salicylates: decreased antihypertensive effect

Theophyllines: decreased bronchodilatation

### Drug/herb

Hawthorn: increased antihypertensive effect

Ephedra: decreased antihypertensive effect

### Drug/lab test

Increased: ANA titer, blood glucose, alkaline phosphatase, LDH, AST, ALT, uric acid

False increase: urinary catecholamines

## NURSING CONSIDERATIONS

### Assessment

- **Hypertension:** monitor B/P at beginning of treatment, periodically thereafter; pulse q4hr; note rate, rhythm, quality: apical/radial pulse before administration; notify prescriber of any significant changes (pulse <50 bpm)
- Check for baselines in renal, liver function tests before therapy begins
- **HF:** assess for edema in feet, legs daily, monitor I&O, daily weight; check for jugular vein distention, crackles bilaterally, dyspnea, report weight gain >5 lb

**BLACK BOX WARNING:** Abrupt discontinuation: Product should be tapered to prevent adverse reactions

- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excreted in breast milk

### Patient/family education

**BLACK BOX WARNING:** Teach patient not to discontinue product abruptly, precipitate angina might occur; taper over 2 wk

- Teach patient not to use OTC products containing α-adrenergic stimulants (such as nasal decongestants, cold preparations); to avoid alcohol, smoking; to limit sodium intake as prescribed
- Teach patient that product may mask symptoms of hypoglycemia; monitor blood glucose closely
- Teach patient how to take pulse and B/P at home; advise when to notify prescriber
- Instruct patient to comply with weight control, dietary adjustments, modified exercise program
- Advise patient to carry/wear emergency ID to identify products being taken, allergies; that product controls symptoms but does not cure the condition
- **Teach patient to report symptoms of HF:** difficulty breathing, especially on exertion or when lying down, night cough, swelling of extremities, bradycardia, dizziness, confusion, depression, fever, difficulty breathing, cold extremities, confusion, rash, sore throat
- Teach patient to take product as prescribed, not to double or skip doses; take any missed doses as soon as remembered if at least 4 hr until next dose
- Advise patient to avoid driving or other hazardous activities until response is known; dizziness, drowsiness occurs
- Teach patient to take product at bedtime for 1 dose
- Teach patient to avoid hot baths, showers

### Evaluation

**Positive therapeutic outcome**
- Decreased B/P in hypertension (after 1-2 wk)
- Absence of dysrhythmias

## TREATMENT OF OVERDOSE:

Lavage, **IV** glucagon or atropine for bradycardia, **IV** theophylline for bronchospasm, digoxin, $O_2$, diuretic for cardiac failure, hemodialysis, **IV** glucose for hyperglycemia, **IV** diazepam (or phenytoin) for seizures

## lacosamide (Rx)

(la-koe'sa-mide)

**Vimpat**

*Func. class.:* Anticonvulsant

*Chem. class.:* Functionalized amino acid

**ACTION:** May act through action at sodium channels; exact action is unknown

**Therapeutic outcome:** Decrease in severity of seizures

**USES:** Partial seizures

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, allergies, renal/hepatic disease, geriatric patients, child <17 yr, acute MI, atrial fibrillation/flutter, AV block, bradycardia, cardiac disease, congenital heart disease, dehydration, depression, dialysis, hazardous activity, electrolyte imbalance, heart failure, labor, PR prolongation, sick sinus syndrome, substance abuse, suicidal ideation, syncope, torsades de pointes

## DOSAGE AND ROUTES

### Adjunctive therapy

**Adult and child ≥17 yr:** PO 50 mg bid, may increase qwk by 100 mg bid to 200-400 mg/day; **IV** 50 mg 2 ×/day, infuse over 30-60 min, may be increased 100 mg/day weekly, up to 200-400 mg/day maintenance

### Monotherapy

**Adult:** PO 100 mg bid, may increase qwk by 100 mg/day in two divided doses, increase 300-400 mg/day in two divided doses

### Renal/hepatic dose

**Adult:** PO/IV max 300 mg/day in mild to moderate hepatic disease or CCr ≤30 ml/min; do not use in severe hepatic disease; reduce dose in renal/hepatic disease in those taking strong CYP3A4, CYP2C9 inhibitors

**Available forms:** Film-coated tabs 50, 100, 150, 200 mg; **IV** 20 ml single-use vials (200 mg/20 ml), oral sol 10 mg/ml

### Implementation

- Store PO products/IV vials at room temp; sol is stable for 24 hr when mixed with compatible diluents in glass or PVC bags at room temp

**PO route**
- **Tablet:** give without regard to meals
- **Oral sol:** measure with calibrated measuring device

**IV route**
- May give undiluted or mixed in 0.9% NaCl, $D_5W$, or LR
- Infuse over 30-60 min, stable for 24 hr at room temperature
- Do not use if discolored or particulates are present; discard unused portions

## ADVERSE EFFECTS

**CNS:** Dizziness, syncope, tremor, vertigo, ataxia, drowsiness, fever, hypoesthesia, paresthesias, depression, fatigue, headache, confusion, irritability, psychological dependence, suicidal ideation, euphoria
**CV:** Atrial fibrillation/flutter, AV block, bradycardia, myocarditis, orthostatic hypotension, palpitations, PR prolongation
**EENT:** Diplopia, blurred vision, nystagmus, tinnitus
**GI:** Nausea, constipation, vomiting, hepatitis, diarrhea, dyspepsia
**HEMA:** Anemia, neutropenia, agranulocytosis
**INTEG:** Rash, erythema, inj site reaction, pruritus, xerostomia
**MS:** Asthenia, dysarthria, muscle cramps
**SYST:** Drug reaction with eosinophilia and systemic symptoms (DRESS), Stevens-Johnson syndrome, toxic epidermal necrolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding <15% |
| **Metabolism** | Liver |
| **Excretion** | Kidneys (95%) |
| **Half-life** | 13 hr (PO), elimination half-life 15-23 hr |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | Unknown | Unknown |
| **Peak** | 1-4 hr (PO) | 30-60 min |
| **Duration** | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Atazanavir, dronedarone, digoxin, lopinavir, ritonavir: increase PR prolongation

### Drug classifications

β-blockers, calcium-channel blockers: increase PR prolongation
CYP2C19 inhibitors (fluconazole, isoniazid, miconazole): increase lacosamide effect

### Drug/lab test

Increased: LFTs

## NURSING CONSIDERATIONS

### Assessment

- **Assess for seizures:** duration, type, intensity, precipitating factors
- Monitor for renal function: albumin concentration
- Assess CV status: orthostatic hypotension, PR prolongation; monitor cardiac status throughout treatment; EKG before therapy (IV), AV block may occur
- **Assess mental status:** mood, sensorium, affect, memory (long, short), depression, suicidal ideation, psychological dependence
- **Pregnancy:** Enroll in UCB Antiepileptic Drugs Registry 888-233-2334, use only if benefits outweigh fetal risk, do not breastfeed, excretion unknown
- **Serious skin reactions:** Assess for rash, discontinue product at first sign of rash, DRESS, Stevens-Johnson syndrome, toxic epidermal necrolysis may occur
- **Beers:** Avoid in older adults unless safer alternatives are not available, may cause ataxia, impaired psychomotor function

### Patient/family education

- Caution patient not to discontinue product abruptly, taper over 1 wk; seizures may occur
- Teach patient to report blurred vision, nausea, dizziness, syncope; Advise patient to avoid hazardous activities until stabilized on product
- Teach patient to report rash, fever, fatigue, yellowing of skin, eyes, dark urine, may be hypersensitivity
- Instruct patient to carry emergency ID stating product use
- Advise patient to notify prescriber of suicidal thoughts or actions, syncope, cardiac changes
- Instruct patient to notify prescriber if pregnancy is planned or suspected to, enroll in pregnancy registry at 888-233-2334, www.aedpregnancyregistry.com
- Teach patient that interactions with other medications may occur, to report all OTC, Rx, herbals, supplements taken, not to use alcohol
- Give patient MediGuide for proper use and risks

### Evaluation

**Positive therapeutic outcome**
- Increased seizure control

## lactulose (Rx)

(lak'tyoo-lose)
**Cholac, Constilac, constulose, Enulose, Generlac, Kristalose**
*Func. class.:* Laxative (hyperosmotic/ammonia detoxicant)
*Chem. class.:* Lactose synthetic derivative

**Do not confuse:** lactulose/lactose

**ACTION:** Prevents absorption of ammonia in colon by acidifying stool; increases water, softens stool

**Therapeutic outcome:** Decreased constipation, decreased blood ammonia level

## USES:
Chronic constipation, portal-systemic encephalopathy in patients with hepatic disease

## CONTRAINDICATIONS
Hypersensitivity, low-galactose diet

**Precautions:** Pregnancy, breastfeeding, geriatric and debilitated patient, diabetes mellitus

## DOSAGE AND ROUTES
### Constipation
**Adult:** PO 15-30 ml/day (10-20 g), may increase to 60 ml/day prn
**Child (unlabeled):** PO 7.5 ml/day

### Hepatic encephalopathy
**Adult:** PO 30-45 ml (20-30 g) tid or qid until stools are soft; retention enema 300 ml diluted
**Infant:** PO (unlabeled) 2.5-10 ml/day in divided doses
**Child:** PO (unlabeled) 40-90 ml/day in divided doses given 3-4 ×/day

**Available forms:** Oral sol 10 g/15 ml; packets: 10, 20 g; rectal sol: 10 g/15 ml

### Implementation
**PO route**
• Give with full glass of fruit juice, water, milk to increase palatability of oral form; for rapid effect, give on empty stomach; increase fluids by 2 L/day; do not give with other laxatives; if diarrhea occurs, reduce dosage
• Kristalose: dissolve contents of packet in 4 oz of water
**Rectal route**
• Administer retention enema (no commercial product) by diluting 300 ml of lactulose/700 ml of water or of 0.9% NaCl; administer by rect balloon catheter; retain for 30-60 min; repeat if evacuated too quickly

## ADVERSE EFFECTS
**GI:** *Nausea, vomiting, anorexia, abdominal cramps, diarrhea,* flatulence, *distention, belching*
**META:** Hypernatremia

### Pharmacokinetics
| | |
|---|---|
| **Absorption** | Poorly absorbed |
| **Distribution** | Not known |
| **Metabolism** | Colonic bacteria to acids |
| **Half-life** | Unknown |

### Pharmacodynamics
Unknown

## INTERACTIONS
### Individual drugs
Neomycin: decreased lactulose effect
NIFEdipine extended release tab: increased GI obstruction

### Drug classifications
Antiinfectives (oral), antacids: decreased lactulose effect
Laxatives: do not use together (hepatic encephalopathy)

### Drug/herb
Flax, senna: increased laxative effect

### Drug/lab test
Blood glucose (diabetic patients): increase
Blood ammonia: decrease

## NURSING CONSIDERATIONS
### Assessment
• **Stool:** Assess for amount, color, consistency
• Monitor glucose levels in diabetic patients (increases)
• **Cause of constipation:** Determine whether fluids, bulk, or exercise is missing from lifestyle
• Monitor blood, urine, electrolytes if used often by patient; may cause diarrhea, hypokalemia, hypernatremia; check I&O ratio to identify fluid loss
• Assess cramping, rectal bleeding, nausea, vomiting; if these symptoms occur, product should be discontinued; identify cause of constipation: identify whether fluids, bulk, or exercise is missing from lifestyle, replace any loss
• **Hepatic encephalopathy:** Monitor blood ammonia level 15-45 mcg/dl or 35-65 umol/L is normal range; monitor for clearing of confusion, lethargy, restlessness, irritability (hepatic encephalopathy); may decrease ammonia level by 50%, monitor sodium in higher doses
• **Pregnancy/breastfeeding:** Only if clearly needed, cautious use in breastfeeding

### Patient/family education
• Discuss with patient that adequate fluid consumption is necessary
• Teach patient that normal bowel movements do not always occur daily
• Teach patient not to use in presence of abdominal pain, nausea, vomiting; tell patient to notify prescriber of unrelieved constipation or if symptoms of electrolyte imbalance occur: muscle cramps, pain, weakness, dizziness, excessive thirst
• Teach patient not to use laxatives for long-term therapy; bowel tone will be lost
• Do not give at bedtime as a laxative; may interfere with sleep

• Notify prescriber if diarrhea occurs; may indicate overdosage

### Evaluation

**Positive therapeutic outcome**

• Decreased constipation
• Decreased blood ammonia level
• Clearing of mental state

## lamiVUDine (3TC) (Rx)

(lam-i'vue-dine)
**Epivir, Epivir-HBV, Heptovir**
*Func. class.:* Antiretroviral
*Chem. class.:* Nucleoside reverse transcriptase inhibitor (NRTI)

**Do not confuse:** lamiVUDine/LamoTRIgine

**ACTION:** Inhibits replication of HIV virus by incorporating into cellular DNA by viral reverse transcriptase, thereby terminating the cellular DNA chain

**Therapeutic outcome:** Improved symptoms of HIV infection

**USES:** HIV-1–related infection in combination with at least 2 other antiretrovirals; chronic hepatitis B (Epivir-HBV)

**Unlabeled uses:** Prophylaxis of HIV postexposure with indinavir and zidovudine

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, geriatric, granulocyte count $<1000/mm^3$ or Hgb $<9.5$ g/dl, renal disease, pancreatitis, peripheral neuropathy

**BLACK BOX WARNING:** Severe hepatic dysfunction, lactic acidosis

## DOSAGE AND ROUTES

### HIV in combination infection

**Adult and adolescent >16 yr and ≥ 50 kg:** PO 150 mg bid or 300 mg/day; <50 kg 2 mg/kg bid
**Child 3 mo-16 yr:** PO 4 mg/kg bid; max 150 mg bid

### Renal dose

**Adult:** PO CCr 30-49 ml/min: Epivir 150 mg/day; Epivir HBV 100 mg 1st dose, then 50 mg/day; CCr 15-29 ml/min: Epivir 150 mg 1st dose, then 100 mg/day; Epivir HBV 100 mg 1st dose, then 25 mg/day; CCr 5-14 ml/min: Epivir 150 mg 1st dose, then 50 mg/day; Epivir HBV 35 mg 1st dose, then 15 mg/day; CCr <5 ml/min: Epivir 50 mg 1st dose, then 25 mg/day; Epivir HBV 35 mg 1st dose, then 10 mg/day

### Chronic hepatitis B with evidence of HBV replication and active liver inflammation

**Adult:** PO 100 mg/day
**Child/adolescent 2-17 yr:** PO 3 mg/kg/day, max 100 mg

**Available forms:** Oral sol **(Epivir)** 10 mg/ml, tabs 150, 300/mg; oral sol **(Epivir-HBV)** 5 mg/ml, tabs 100 mg

### Implementation

• Epivir and Epivir-HBV are not interchangeable
• Administer PO daily, bid without regard to meals
• Give with other antiretrovirals only, do not triple antiretrovirals with abacavir or didanosine, resistance may occur
• Store in cool environment; protect from light

## ADVERSE EFFECTS

**CNS:** *Fever, headache, malaise, dizziness, insomnia, depression, fatigue, chills,* seizures, peripheral neuropathy, paresthesia
**EENT:** Taste change, hearing loss, photophobia
**GI:** *Nausea, vomiting, diarrhea,* anorexia, cramps, dyspepsia, hepatomegaly with steatosis, pancreatitis (more common in children)
**HEMA:** Neutropenia, anemia, thrombocytopenia
**INTEG:** *Rash*
**MS:** *Myalgia, arthralgia, pain*
**RESP:** *Cough*
**SYST:** Lactic acidosis, anaphylaxis, Stevens-Johnson syndrome, immune reconstitution syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Extravascular space |
| **Metabolism** | Protein binding <36% |
| **Excretion** | Unchanged in urine |
| **Half-life** | Terminal half-life 5-7 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

AMILoride, dofetilide, entecavir, metFORMIN, memantine, procainamide, trospium, trimethoprim/sulfamethoxazole: increased level of lamiVUDine
Emtricitabine: do not combine, duplication
Other products that cause pancreatitis Increase: Pancreatitis
Sulfamethoxazole trimethoprim: Increase: Lamotrigine level

Zalcitabine: decreased both products, avoid concurrent use

### Drug/lab test

Increased: ALT, bilirubin, lipase, CK
Decreased: Hgb, neutrophil, platelet count

## NURSING CONSIDERATIONS

### Assessment

- **HIV:** Test for HIV before starting treatment; monitor blood counts q2wk; watch for neutropenia, thrombocytopenia, Hgb, CD4, viral load, lipase, triglycerides periodically during treatment; if low, therapy may have to be discontinued and restarted after hematologic recovery; blood transfusions may be required; assess for lessening of symptoms; if HBV is present, a higher dose of Epivir-HBV is needed
- Hepatitis B: Assess for fatigue, anorexia, pruritus, jaundice during and for several months after discontinuation; monitor liver function tests: AST, ALT, bilirubin; amylase; bilirubin, triglycerides, lipase
- **Monitor children for pancreatitis:** abdominal pain, nausea, vomiting, neuropathy, discontinuing may be required; monitor amylase, lipase, use cautiously in children

**BLACK BOX WARNING: Assess for lactic acidosis, severe hepatomegaly with steatosis:** obtain baseline liver function tests; if elevated, discontinue treatment; discontinue even if liver function tests are normal and symptoms of lactic acidosis, severe hepatomegaly develops; may be fatal, especially in women

- **Pregnancy/breastfeeding:** Epivir is a drug that is used in pregnancy to treat HIV, enroll in the Antiretroviral Pregnancy Registry at 800-258-4263, do not breastfeed

### Patient/family education

- Teach patient that GI complaints and insomnia resolve after 3-4 wk of treatment
- Tell patient that product is not a cure for AIDS but will control symptoms; compliance is needed, take as directed, to complete full course of treatment even if feeling better
- Teach patient to notify prescriber of sore throat, swollen lymph nodes, malaise, fever, peripheral neuropathy; other infections may occur
- Teach patient to report pancreatitis, immune reconstitution syndrome immediately
- Teach patient that virus is still infective, may pass AIDS virus to others
- Encourage patient to continue follow-up visits since serious toxicity may occur; blood counts must be done q2wk
- Tell patient that other products may be necessary to prevent other infections
- Teach patient that product may cause fainting or dizziness
- **Pregnancy/breastfeeding:** To enroll in the Antiretroviral Pregnancy Registry at 800-258-4263, not to breastfeed

### Evaluation

**Positive therapeutic outcome**

- Absence of infection, symptoms of HIV infection

## lamoTRIgine (Rx)

(lam-o-trye'geen)
**LaMICtal, Lamictal CD, Lamictal ODT, Lamictal XR**
*Func. class.:* Anticonvulsant—miscellaneous
*Chem. class.:* Phenyltriazine

**Do not confuse:** lamoTRIgine/lamiVUDine, LaMICtal/LamISIL/Lomotil

**ACTION:** May inhibit voltage-sensitive sodium channels, decreasing seizures

**Therapeutic outcome:** Decrease in intensity and number of seizures

**USES:** Adjunct in the treatment of partial, tonic-clonic seizures, children with Lennox-Gastaut syndrome, bipolar disorder

**Unlabeled uses:** Absence seizures

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy (cleft lip/palate in 1st trimester), breastfeeding, geriatric, renal/hepatic/cardiac disease, severe depression, suicidal ideation, blood dyscrasias, children <16 yr, serious rash

## DOSAGE AND ROUTES

**Seizures:** monotherapy
**Adult and adolescent ≥16 yr:** PO 50 mg/day for wk 1 and 2, then increase to 100 mg divided bid for wk 3 and 4; maintenance 300-500 mg/day; receiving enzyme inducing AEDs (carBAMazepine, PHENobarbital, phenytoin, primidone but not valproic acid); ext rel 50 mg/day × 1-2 wks, then 100 mg/day during wk 3-4, then 200 mg/day during wk 5, then 300 mg/day during wk 6, then 400 mg/day during wk 7; after wk 7 range is 400-600 mg/day
**Adolescent <16 yr and child:** PO 0.3 mg/kg/day wk 1 and 2, then 0.6 mg/kg/day wk 3 and 4; depends on use of AED; usual dosage 4.5-7.5 mg/kg/day, max 300 mg/day

### Monotherapy for patients taking valproate

**Adult/adolescent ≥16 yr:** receiving lamoTRIgine and valproate, without enzyme-inducing drug PO (immediate-release) stabilize on valproate and target dose of 200 mg/day lamoTRIgine; if patient is not taking lamoTRIgine 200 mg/day, increase dose by 25-50 mg/day q1-2wk to reach 200 mg/day; while maintaining lamoTRIgine 200 mg/day, decrease valproate to 500 mg/day by ≤500 mg/day/wk, maintain valproate at 500 mg/day × 1 wk, then increase lamoTRIgine to 300 mg/day, while decreasing valproate 250 mg/day × 1 wk, then discontinue valproate and increase lamoTRIgine by 100 mg/day qwk to maintenance dosage of 500 mg/day

### Seizures: multiple therapy with valproate

**Adult and adolescent ≥16 yr:** PO 25 mg every other day, then 25 mg/day wk 3-4, increase by 25-50 mg q1-2wk; maintenance 100-500 mg/day
**Adolescent <16 yr and child:** PO 0.1-0.2 mg/kg/day initially, then increase q2wk as needed to 1.5 mg/kg/day or 200 mg/day

### Bipolar disorder (Escalation regimen in those not taking carBAMazepine, or other enzyme-inducing drugs or valproate)

**Adult and adolescent ≥16 yr:** PO wk 1-2 25 mg/day; wk 3-4 50 mg/day; wk 5 100 mg/day; wk 6-7 200 mg/day; for patients taking valproic acid: wk 1-2 25 mg every other day; wk 3-4 25 mg/day; wk 5 50 mg/day; wk 6 100 mg/day; wk 7 100 mg/day

### Hepatic dose

**Adult (moderate hepatic impairment or severe without ascites):** PO reduce by 25%
**Adult (severe hepatic impairment with ascites):** PO reduce by 50%

### Depression with epilepsy (unlabeled)

**Adult:** PO 100-500 mg/day

**Available forms:** Tabs 25, 100, 150, 200 mg; chew tabs 5, 25 mg; oral disintegrating tab 25, 50, 100, 200 mg; oral disintegrating 25-50, 50-100, 25-50-100 mg titration kit; PO ext rel 25-50-100, 50-100-200 mg titration kit; PO 25-100 mg starter kit, ext rel 25, 50, 100, 250, 300 mg

### Implementation

**PO route**

- Extended-release product is not to be used for conversion to monotherapy from ≥ 2 antiepileptic products
- **Orange Starter Kit:** for those **NOT** taking carBAMazepine, phenytoin, PHENobarbital, primidone, rifampin, or valproate
- **Green Starter Kit:** for those taking carBAMazepine, phenytoin, PHENobarbital, primidone, rifampin but **NOT** valproate
- Blue Starter Kit: for those taking valproate
- Discontinue all products gradually ≥2 wk, abrupt discontinuation can increase seizures
- All forms may be given without regard to meals
- **Chewable dispersible tab:** may be swallowed whole, chewed, mixed in water or fruit juice; to mix add to small amount of liquid in a glass or spoon, tabs will dissolve in 1 min, then mix in more liquid and swirl and swallow immediately
- **Orally disintegrating tabs:** place on tongue, move around in mouth, when disintegrated, swallow; examine blister pack before use, do not use if blisters are torn or missing; do not cut tabs in half
- **Extended-release tabs:** swallow whole, do not cut, break, chew
- Give correct starter kit: severe side effects have occurred from incorrect starter kit
- Give in divided doses with or after meals to decrease adverse effects

## ADVERSE EFFECTS

**CNS:** Fever, insomnia, tremor, depression, anxiety, *dizziness,* ataxia, *headache,* suicidal ideation, seizures, poor concentration
**EENT:** Nystagmus, *diplopia, blurred vision*
**GI:** *Nausea, vomiting, anorexia,* abdominal pain, hepatotoxicity
**GU:** *Dysmenorrhea*
**HEMA:** Anemia, DIC, leukopenia, thrombocytopenia
**INTEG:** Rash (potentially life-threatening), alopecia, photosensitivity
**CV:** chest pain, palpitations
**MS:** neck pain, myalgias
**SYST:** Stevens-Johnson syndrome, angioedema, toxic epidermal necrolysis, DRESS

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed, rapid |
| **Distribution** | Protein binding 55%, crosses placenta |
| **Metabolism** | Glucuronic acid conjunction |
| **Excretion** | Excreted in breast milk |
| **Half-life** | Terminal 24 hr; 15 hr with enzyme inducers |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1.4-2.3 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Acetaminophen, carBAMazepine, OXcarbazepine, PHENobarbital, phenytoin, primidone: decreased lamoTRIgine serum concentration

Valproic acid: decreased metabolic clearance of lamoTRIgine

### Drug classifications

CYP3A4 inhibitors: decreased metabolic clearance of lamoTRIgine

Contraceptives (oral), estrogens, succinimides, rifamycins: decreased lamoTRIgine serum concentration

### Drug/herb

Ginkgo: increased anticonvulsant effect

Ginseng, santonica: decreased anticonvulsant effect

## NURSING CONSIDERATIONS

### Assessment

- Assess for rash (Stevens-Johnson syndrome or toxic epidermal necrolysis) in pediatric patients; product should be discontinued at first sign of rash, more common in those taking multiple products for seizures, rash usually occurs during 2-8 wk of therapy
- **Assess for seizure activity:** duration, type, intensity, halo before seizure
- Assess for hypersensitive reactions
- **Bipolar disorder:** suicidal thoughts/behaviors
- **DRESS:** Monitor for fever, rash, lymphadenopathy, may be with hepatitis, nephritis, myocarditis, discontinue immediately

### Patient/family education

- Caution patient not to discontinue product abruptly; seizures may occur
- Caution patient to avoid hazardous activities until stabilized on product
- Advise patient to notify prescriber of skin rash or increased seizure activity
- Instruct patient to report to prescriber if pregnancy is suspected or planned
- Teach patient to use sunscreen and protective clothing; photosensitivity occurs
- Advise patient to carry/wear emergency ID stating product use
- Advise patient to notify prescriber immediately of suicidal thoughts, behaviors
- Teach patient to notify prescriber if pregnancy is planned or suspected, use a nonhormonal contraceptive; enroll with the North American Antiepileptic Drug Pregnancy Registry at 888-233-2334 (www.aedpregnancyregistry.org), product decreases folate; avoid breastfeeding
- **Rash:** Teach patient to notify prescriber immediately if rash, fever, or swollen lymph nodes occur

### Evaluation

**Positive therapeutic outcome**

- Decrease in severity of seizures or severity of bipolar symptoms

## lansoprazole (Rx, OTC)

(lan-soe'prah-zole)

**Prevacid, Prevacid SoluTab**

*Func. class.:* Proton-pump inhibitor

*Chem. class.:* Benzimidazole

**Do not confuse:** Prevacid/Pravachol/Prinivil

**ACTION:** Suppresses gastric secretion by inhibiting hydrogen/potassium ATPase enzyme system in gastric parietal cell; characterized as gastric acid pump inhibitor since it blocks final step of acid production

**Therapeutic outcome:** Reduction in gastric pain, swelling, fullness

**USES:** Gastroesophageal reflux disease (GERD), severe erosive esophagitis, poorly responsive systemic GERD, pathologic hypersecretory conditions (Zollinger-Ellison syndrome, systemic mastocytosis, multiple endocrine adenomas); possibly effective for treatment of duodenal, gastric ulcers, maintenance of healed duodenal ulcers

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, hypomagnesemia, osteoporosis

## DOSAGE AND ROUTES

### Frequent heartburn

**Adult:** PO 15 mg qd up to 14 days

### Duodenal ulcer

**Adult:** PO 15 mg/day before meals for 4 wk, then 15 mg/day to maintain healing of ulcers; ulcers associated with ***Helicobacter pylori:*** 30 mg lansoprazole, metronidazole 500 mg bid-qid 14 days or 30 mg lansoprazole bid, 1 g amoxicillin tid, levofloxacin 500 mg qday × 14 days

### Pathologic hypersecretory conditions

**Adult:** PO 60 mg/day, may give up to 90 mg bid, administer >120 mg/day in divided doses

### GERD/esophagitis
**Adult/adolescent:** PO 15-30 mg/day × 8 wk
**Child 1-11 yr (>30 kg):** PO 30 mg/day ≤12 wk
**Child 1-11 yr (≤30 kg):** 15 mg/day ≤12 wk

### Stress gastric prophylaxis
**Adult:** NG use 30 mg oral cap or 300 mg disintegrating tab

**Available forms:** del rel caps 15, 30 mg; oral powder; orally disintegrating tabs 15, 30 mg

### Implementation
**PO route**
- Swallow del rel cap whole; do not break, crush, chew, or open
- Administer before eating
- **Oral cap:** Open cap and pour ¼ of granules into NG feeding syringe with plunger removed, slowly add water and depress plunger, repeat until all granules are used, flush tube with 15 ml water
- Place on tongue, allow to dissolve, use without regard to water
- **Oral syringe:** Dissolve 15 mg/4 ml or 30 mg/10 ml water; use extra water in syringe to remove all of the product

**NG tube**
- **Oral disintegrating tab:** Mix 30 mg tab in 10 ml water, give via NG tube, flush tube with 10 ml sterile water, clamp for 60 min

## ADVERSE EFFECTS
**CNS:** *Headache*
**GI:** Diarrhea, abdominal pain, vomiting, nausea, *constipation,* flatulence, acid regurgitation, anorexia, irritable colon, microscopic colitis, pseudomembranous colitis
**GU:** Hematuria, glycosuria, impotence, kidney calculus, breast enlargement

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid after granules leave stomach |
| **Distribution** | Protein binding 97% |
| **Metabolism** | Liver extensively |
| **Excretion** | Urine, feces; clearance decreased in geriatric, renal/hepatic disease |
| **Half-life** | Plasma 1.5 hr |

### Pharmacodynamics
Unknown

## INTERACTIONS
### Individual products
Octreotide, misoprostol: decreased lansoprazole effect
Extended release amphetamine/dextroamphetamine: decreased release of extended-release product
Calcium carbonate, iron salts, itraconazole, ketoconazole, atazanavir, ampicillin: decreased absorption of each specific product
FluvoxaMINE, voriconazole: increased lansoprazole toxicity
Warfarin: increased bleeding risk
Sucralfate: delayed absorption of lansoprazole
Clopidogrel: decreased antiplatelet effect

### Drug/herb
- Avoid use with red yeast rice, St. John's wort

### Drug/food
- Food decreases rate of absorption; use before food

### Drug classifications
Loop/thiazide diuretics: increased hypomagnesemia
Antimuscarinics, $H_2$ blockers: decreased lansoprazole effect

## NURSING CONSIDERATIONS
### Assessment
- **Pseudomembranous colitis:** bowel sounds q8hr, abdomen for pain, swelling, anorexia, blood in stool, may occur even after completion of therapy
- Monitor liver enzymes (AST, ALT, alkaline phosphatase) during treatment
- Monitor INR and pro-time when taking warfarin
- Low magnesium may occur
- **Beers:** Avoid scheduling use for .8 wk unless for high-risk patients (oral corticosteroids/chronic NSAIDs use)

### Patient/family education
- Instruct patient to report severe diarrhea, cramping, blood in stools, fever product may have to be discontinued
- Inform diabetic patient that hypoglycemia may occur, to monitor blood glucose
- Encourage patient to avoid hazardous activities; dizziness may occur
- Tell patient to avoid alcohol, salicylates, ibuprofen; may cause GI irritation
- Teach patient that if using OTC for heartburn, it may take 1-4 days to see full benefit
- **Pregnancy:** Teach patient to notify provider if pregnancy is planned or suspected, if breastfeeding do not breastfeed

### Evaluation
**Positive therapeutic outcome**
- Absence of gastric pain, swelling, fullness

RARELY USED

## lapatinib (Rx)

(la-pa′tin-ib)

**Tykerb**

*Func. class.:* Antineoplastic—miscellaneous

*Chem. class.:* Biologic response modifier, signal transduction inhibitor (STIs)

**Therapeutic outcome:** Decrease in breast cancer progression

**USES:** Advanced/metastatic breast cancer patients with tumor that overexpresses HER2 protein and who have received previous chemotherapy

### CONTRAINDICATIONS

Pregnancy, hypersensitivity, breastfeeding

### DOSAGE AND ROUTES

**Advanced/metastatic breast cancer with HER2 overexpression who have received previous therapy**

**Adult:** PO 1250 mg (5 tabs)/day 1 hr before or after food on days 1-21 plus capecitabine 2000 mg/m$^2$/day in 2 divided doses on days 1-14 in a repeating 21-day cycle; continue until therapeutic response or toxicity occurs

**Metastatic breast cancer with HER2 overexpression for whom hormonal therapy is indicated**

**Adult:** PO 1500 mg (6 tabs) 1 hr before food with letrozole 2.5/day

**Hepatic dose**

**Adult (Child-Pugh C):** PO 750 mg/day (with capecitabine); 1000 mg/day (with letrozole)

## latanoprost ophthalmic

*See Appendix B*

⚠ HIGH ALERT

## ledipasvir/sofosbuvir

(le-dip′as-vir/soe-fos′bue-veer)

**Harvoni**

*Func. class.:* Antiviral antihepatitis agent

*Chem. class.:* N55A inhibitor

**ACTION:** A combination product with a HCV NS5A inhibitor (ledipasvir) and a nucleotide analog HCV NS5B polymerase inhibitor (sofosbuvir)

**Therapeutic outcome:** Hepatitis C RNA reduction

**USES:** Chronic hepatitis C virus (HCV) genotype 1 infection in patients with compensated liver disease

### CONTRAINDICATIONS: Hypersensitivity

**Precautions:** Decompensated hepatic disease, decompensated cirrhosis, severe renal impairment (eGFR <30 ml/min/1.73 m$^2$), end-stage renal failure requiring dialysis, pregnancy, breastfeeding

### DOSAGE AND ROUTES

**Adults with or without cirrhosis who are treatment-naive: PO** one tab (90 mg ledipasvir; 400 mg sofosbuvir) every day with or without food for 12 wk; 8 wk can be considered for those patients with a baseline HCV RNA <6 million IU/ml

**Adults without cirrhosis who are treatment-experienced: PO** one tab (90 mg ledipasvir; 400 mg sofosbuvir) every day with or without food for 12 wk

**Adults with cirrhosis who are treatment-experienced: PO** one tab (90 mg ledipasvir; 400 mg sofosbuvir) every day with or without food for 24 wk

**Oral dosage**

**Adult (treatment-naive) without cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with or without food. The recommended duration of treatment is 12 wk; however, an 8-wk treatment duration can be considered for those patients with a baseline hepatitis C virus RNA less than 6 million international units/ml. Recommendation includes patients coinfected with HIV

**Adults (treatment-naive) with compensated (Child-Pugh A) cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with or without food. The recommended duration of treatment is 12 wk. Recommendation includes patients coinfected with HIV

**Adults (treatment-experienced) without cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with or without food. The recommended duration of treatment is 12 wk. Recommendation includes patients coinfected with HIV

**Adults (treatment-experienced) with compensated (Child-Pugh A) cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with or without food. The recommended duration of treatment is 24 wk. Alternatively, treatment duration may be reduced to 12 wk if ledipasvir; sofosbuvir is administered in combination with ribavirin. Ribavirin must be administered with food in two divided doses, and the dose is based on weight as follows: less than 75 kg give 500 mg PO twice daily; 75 kg or more

give 600 mg PO twice daily. Recommendation includes patients coinfected with HIV

**Adults (treatment-naive and experienced) with decompensated (Child-Pugh B or C) cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with ribavirin (600 mg PO once daily) for 12 wk. Ribavirin must be administered with food, and if tolerated, the dose may be increased as follows: if less than 75 kg give 500 mg PO twice daily; if 75 kg or more give 600 mg PO twice daily. Consider decreasing ribavirin dose for abnormal hemoglobin. Recommendation includes patients coinfected with HIV

**Adults (treatment-naive and experienced) who have undergone liver transplantation and are without cirrhosis or have compensated (Child-Pugh A) cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with ribavirin for 12 wk. Ribavirin must be administered with food in two divided doses, and the dose is based on weight as follows: less than 75 kg give 500 mg PO twice daily; 75 kg or more give 600 mg PO twice daily. Recommendation includes patients coinfected with HIV

**Children and adolescent 12 to 17 yr (treatment-naive) without cirrhosis or with compensated (Child-Pugh A) cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with or without food. The recommended duration of treatment is 12 wk. Recommendation includes patients coinfected with HIV

**Children and adolescent 12 to 17 yr (treatment-experienced) without cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with or without food. The recommended duration of treatment is 12 wk. Recommendation includes patients coinfected with HIV

**Children and adolescent 12 to 17 yr (treatment-experienced) with compensated (Child-Pugh A) cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with or without food. The recommended duration of treatment is 24 wk. Recommendation includes patients coinfected with HIV

**Children younger than 12 years weighing at least 35 kg (treatment-naive) without cirrhosis or with compensated (Child-Pugh A) cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with or without food. The recommended duration of treatment is 12 wk. Recommendation includes patients coinfected with HIV

**Children younger than 12 yr weighing at least 35 kg (treatment-experienced) without cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with or without food. The recommended duration of treatment is 12 wk. Recommendation includes patients coinfected with HIV

**Children younger than 12 yr weighing at least 35 kg (treatment-experienced) with compensated (Child-Pugh A) cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with or without food. The recommended duration of treatment is 24 wk. Recommendation includes patients coinfected with HIV

### For the treatment of chronic hepatitis C virus (HCV) genotype 4 infection

#### Oral dosage

**Adult (treatment-naive and experienced) without cirrhosis or who have compensated (Child-Pugh A) cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with or without food. The recommended duration of treatment is 12 wk. Recommendation includes patients coinfected with HIV

**Adult (treatment-naive and experienced) who have undergone liver transplantation and are without cirrhosis or have compensated (Child-Pugh A) cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with ribavirin for 12 wk. Ribavirin must be administered with food in two divided doses, and the dose is based on weight as follows: less than 75 kg give 500 mg PO twice daily; 75 kg or more give 600 mg PO twice daily. Recommendation includes patients coinfected with HIV

**Children and adolescent 12 to 17 yr (treatment-naive and experienced) without cirrhosis or who have compensated (Child-Pugh A) cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with or without food. The recommended duration of treatment is 12 wk. Recommendation includes patients coinfected with HIV

**Children younger than 12 yr weighing at least 35 kg (treatment-naive and experienced) without cirrhosis or who have compensated (Child-Pugh A) cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with or without food. The recommended duration of treatment is 12 wk. Recommendation includes patients coinfected with HIV

### For the treatment of chronic hepatitis C virus (HCV) genotypes 5 or 6 infection

#### Oral dosage

**Adult (treatment-naive and experienced) without cirrhosis or who have compensated (Child-Pugh A) cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with

or without food. The recommended duration of treatment is 12 wk. Recommendation includes patients coinfected with HIV

**Children and adolescent 12 to 17 yr (treatment-naive and experienced) without cirrhosis or who have compensated (Child-Pugh A) cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with or without food. The recommended duration of treatment is 12 wk. Recommendation includes patients coinfected with HIV

**Children younger than 12 yr weighing at least 35 kg (treatment-naive and experienced) without cirrhosis or who have compensated (Child-Pugh A) cirrhosis:** 1 tablet (90 mg ledipasvir; 400 mg sofosbuvir) PO once daily with or without food. The recommended duration of treatment is 12 wk. Recommendation includes patients coinfected with HIV

**Available forms:** Tab 90/400 mg

### Implementation

- Use without regard to food

## ADVERSE EFFECTS

**CNS:** *Fatigue, headache,* insomnia
**GI:** Nausea, vomiting, diarrhea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Ledipasvir: >99.8% protein binding, Sofosbuvir: 61%-65% protein binding |
| **Metabolism** | Unknown |
| **Excretion** | Ledipasvir: biliary; Sofosbuvir: kidneys 80% recovered in the urine |
| **Half-life** | Terminal half-life 47 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Ledipasvir peak 4-5 hr, Sofosbuvir peak 0.8-1 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Digoxin: Increased digoxin level: Anticonvulsants, antimycobacterials (rifabutin, rifAMPin, rifapentine), p-glycoprotein inducers, avoid using together
Decrease: ledipasvir/sofosbuvir level
H2 receptor antagonists (famotidine): Decrease: Ledipasvir level, separate by ≤ 12 hr, max dose of H2 receptor antagonist should not exceed famotidine 40 mg bid equivalent
Avoid use with products that increase P-glycoprotein

### Drug/lab test

Increased: bilirubin, lipase, CK

## NURSING CONSIDERATIONS

### Assessment

- Hepatitis C: monitor hepatitis C RNA, serum bilirubin, creatinine
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excretion unknown

### Patient/family education

- Instruct patient to report effects to the prescriber
- Teach patient to take at the same time each day and use for full course even if feeling better, to take missed doses when remembered on the same day, do not take double doses
- Teach patient will not decrease transmission of infection of others
- Teach patient to notify all providers of product

### Evaluation

**Positive therapeutic outcome**

- Hepatitis C RNA reduction

## leflunomide (Rx)

(leh-floo'noh-mide)
**Arava**
*Func. class.:* Antirheumatic (DMARDs)
*Chem. class.:* Immune modulator, pyrimidine synthesis inhibitor

**ACTION:** Inhibits an enzyme involved in pyrimidine synthesis and has antiproliferative, antiinflammatory effect

**Therapeutic outcome:** Decreased pain, joint swelling, increased mobility

**USES:** Rheumatoid arthritis, to reduce disease process as well as symptoms

**Unlabeled uses:** Juvenile rheumatoid arthritis

## CONTRAINDICATIONS

Breastfeeding, hypersensitivity

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Children, renal disorders, vaccinations, infection, alcoholism, immunosuppression, jaundice, lactase deficiency, hepatic disease

## DOSAGE AND ROUTES

**Adult:** PO loading dose 100 mg/day × 3 days, maintenance 20 mg/day; may be decreased to 10 mg/day if not well tolerated

### Juvenile rheumatoid arthritis (unlabeled)

**Adolescent and child >40 kg:** PO 20 mg/day
**Adolescent and child 20-40 kg:** PO 15 mg/day
**Adolescent and child 10-19.9 kg:** PO 10 mg/day

**Available forms:** Tabs 10, 20, 100 mg

### Implementation

- Give with full glass of water to enhance absorption
- Give PO with food, milk, or antacids for GI upset, give same time each day; loading dose is recommended
- **Drug elimination:** to eliminate product give cholestyramine 8 g tid × 11 days, check levels

## ADVERSE EFFECTS

**CNS:** Dizziness, insomnia, depression, paresthesia, anxiety, migraine, neuralgia, headache
**CV:** Palpitations, hypertension, chest pain, angina pectoris, peripheral edema
**EENT:** Pharyngitis, oral candidiasis, stomatitis, dry mouth, blurred vision
**GI:** *Nausea, anorexia, vomiting, constipation, flatulence, diarrhea, increased liver function tests,* hepatotoxicity, weight loss
**HEMA:** Anemia, ecchymosis, hyperlipidemia
**INTEG:** Rash, pruritus, alopecia, acne, hematoma, herpes infections
**RESP:** Pharyngitis, rhinitis, bronchitis, cough, respiratory infection, pneumonia, sinusitis, interstitial lung disease
**SYST:** Opportunistic/fatal infections, Stevens-Johnson syndrome, toxic epidermal necrolysis, DRESS

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Cholestyramine: decreased effect of leflunomide, use for overdose
Methotrexate: increased hepatotoxicity
Rifampin: increased leflunomide levels

### Drug classifications

Hepatotoxic agents: increased side effects of leflunomide
Live virus vaccines: decreased antibody reaction
NSAIDs: increased NSAID effect

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Hepatic necrosis/failure: Hepatic studies:** If ALT elevations are >2× ULN, reduce dose to 10 mg/day, monitor monthly or more frequently

- Screen for latent TB before starting treatment; if TB is present, treat before using this product
- **Interstitial lung disease:** assess for worsening cough, dyspnea, fever; may need to be discontinued, and drug elimination procedure initiated (rare)
- Monitor liver function tests: if ALT elevations are >2 times baseline, reduce dosage to 10 mg/day
- Obtain CBC with differential qmo × 6 mo, then q6-8wk thereafter, pregnancy test, electrolytes
- **Assess arthritic symptoms:** ROM, mobility, swelling of joints, baseline, during treatment
- **Assess for infection:** fatal opportunistic infections can occur

**BLACK BOX WARNING: Pregnancy:** Determine that patient is not pregnant before treatment; not to be given to women of childbearing potential who are not using reliable contraception

- **Stevens-Johnson syndrome, toxic epidermal necrolysis:** Monitor for rash during treatment, if rash with fever, fatigue, joint aches, blisters are present discontinue immediately, initiate drug elimination procedure

### Patient/family education

- Teach patient that product must be continued for prescribed time to be effective, that up to a month may be required for improvement
- Instruct patient to take with food, milk, or antacids to avoid GI upset, take at same time of day
- Advise patient to use caution when driving; drowsiness, dizziness may occur

• Advise patient to take with a full glass of water to enhance absorption, may continue with correct prescribed treatment with other antiinflammatories

**BLACK BOX WARNING: Pregnancy:** Advise patient not to become pregnant while taking this product

• Inform patient that hair may be lost, review alternatives
• Advise patient to avoid live virus vaccinations during treatment

### Evaluation

**Positive therapeutic outcome**
• Increased joint mobility without pain
• Decreased joint swelling

## TREATMENT OF OVERDOSE:

Give cholestyramine 8 g tid × 11 days

**⚠ HIGH ALERT**

## letrozole (Rx)

(let'tro-zohl)
**Femara**
*Func. class.:* Antineoplastic, nonsteroidal aromatase inhibitor

**Do not confuse:** Femoral/Femhrt

**ACTION:** Binds to the heme group of aromatase; inhibits conversion of androgens to estrogens to reduce plasma estrogen levels

**Therapeutic outcome:** Decreased spread of malignancy

**USES:** Early, advanced, or metastatic breast cancer in postmenopausal women who are hormone receptor positive

## CONTRAINDICATIONS

Pregnancy, hypersensitivity, premenopausal females

**Precautions:** Hepatic disease, respiratory disease, osteoporosis

## DOSAGE AND ROUTES

**Adult:** PO 2.5 mg/day

**Available forms:** Tabs 2.5 mg

### Implementation

• May administer bisphosphonates to increase bone density
• Give with food or fluids for GI upset
• Give in equal intervals q6hr

## ADVERSE EFFECTS

**CNS:** Somnolence, dizziness, depression, anxiety, *headache, lethargy*
**CV:** Angina, MI, CVA, thromboembolic events, peripheral edema, hypertension
**GI:** *Nausea, vomiting, anorexia,* constipation, heartburn, diarrhea
**GU:** Endometrial cancer, vaginal bleeding, endometrial proliferation disorder
**INTEG:** *Rash, pruritus,* alopecia, sweating
**MISC:** Hot flashes, night sweats, second malignancies, anaphylaxis, angioedema
**MS:** Arthralgia, arthritis, bone fracture, myalgia, osteoporosis
**RESP:** Dyspnea, cough

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed, steady state 2-6 wk |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | Terminal 48 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2 days |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Estrogens, oral contraceptives: decreased letrozole effect

## NURSING CONSIDERATIONS

### Assessment

• Monitor temperature q4hr; may indicate beginning of infection
• Monitor LFTs before, during therapy (bilirubin, AST, ALT, LDH) as needed or monthly

### Patient/family education

• Advise patient to avoid use of alcohol, which potentiates this product
• Tell patient that product may be taken without regard to meals
• Teach patient to report vaginal bleeding, diarrhea, chest/bone pain
• Advise patient to use adequate contraception in perimenopausal, recently menopausal women

### Evaluation

**Positive therapeutic outcome**
• Prevention of rapid division of malignant cells, postmenopausal cancer, prostate cancer

**RARELY USED**

## leucovorin (Rx)

(loo-koe-vor'in)
*Func. class.:* Vitamin/folic acid antagonist antidote
*Chem. class.:* Tetrahydrofolic acid derivative

**USES:** Megaloblastic or macrocytic anemia caused by folic acid deficiency, overdose of folic acid antagonist, methotrexate toxicity, toxicity caused by pyrimethamine/trimethoprim/trimetrexate, pneumocystosis, toxoplasmosis

## CONTRAINDICATIONS

Hypersensitivity to this product or folic acid, benzyl alcohol, anemias other than megaloblastic not associated with vit $B_{12}$ deficiency

## DOSAGE AND ROUTES

### Megaloblastic anemia caused by enzyme deficiency

**Adult and child:** PO/IM/**IV** up to 6 mg/day

### Megaloblastic anemia caused by deficiency of folate

**Adult and child:** IM 1 mg or less/day until adequate response

### Advanced colorectal cancer

**Adult: IV** 200 mg/m$^2$, then 5-fluorouracil 370 mg/m$^2$; or leucovorin 20 mg/m$^2$, then 5-fluorouracil 425 mg/m$^2$; give daily × 5 days q4-5wk

### Methotrexate toxicity—leucovorin rescue

**Adult and child:** PO/IM/**IV (normal elimination)** given 6 hr after dose of methotrexate 10 mg/m$^2$ until methotrexate is $<5 \times 10^{-8}$ m, CCr has increased 50% above prior level, or methotrexate level is $5 \times 10^{-8}$ m at 24 hr or at 48 hr level is $>9 \times 10^{-8}$ m; give leucovorin 100 mg/m$^2$ q3hr until level drops to $<10^{-8}$ m

### Pyrimethamine/trimethoprim toxicity

**Adult and child:** PO/IM 5-15 mg/day

**⚠ HIGH ALERT**

## leuprolide (Rx)

(loo-proe'lide)
**Eligard, Lupron, Lupron Depo, Lupron Depot-Ped**
*Func. class.:* Antineoplastic hormone
*Chem. class.:* Gonadotropin-releasing hormone

**Do not confuse:** Lupron/Lopurin/Nuprin

**ACTION:** Causes initial increase in circulating levels of LH, FSH; continuous administration results in decreased LH, FSH; in men testosterone is reduced to castration levels; in premenopausal women estrogen is reduced to menopausal levels

**Therapeutic outcome:** Prevention of rapidly growing malignant cells in prostate cancer, decreased pain in endometriosis, resolution of central precocious puberty (CPP)

**USES:** Metastatic prostate cancer (inj implant), management of endometriosis (depot), CPP, uterine leiomyomata (fibroids)

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity to GnRH or analogs, thromboembolic disorders, undiagnosed vaginal bleeding; Viadur implant or Eligard should not be used in women or children

**Precautions:** Edema, hepatic disease, CVA, MI, seizures, hypertension, diabetes mellitus, HF, depression, osteoporosis, spinal cord compression, urinary tract obstruction

## DOSAGE AND ROUTES

### Advanced prostate cancer

**Adult:** SUBCUT 1 mg/day; IM depot 7.5 mg/dose qmo; Viadur implant (72 mg) qyr; or IM depot 22.5 mg q3mo; or IM depot 30 mg q4mo; or IM depot 45 mg q6mo; SUBCUT (Eligard) 7.5 mg qmo; 22.5 mg q3mo, q6mo

### Endometriosis/fibroids

**Adult:** IM 3.75 mg qmo for 6 mo, 11.25 mg q3mo for 6 mo, or IM 30 mg q4mo

### Anemia related to uterine fibroids

**Adult:** IM 3.75 mg depot qmo × 3 mo or 11.25 mg depot as a single dose

### Central precocious puberty

**Child:** SUBCUT 50 mcg/kg/day; increase as needed by 10 mcg/kg/day
**Child >37.5 kg:** IM 15 mg q4wk
**Child 25-37.5 kg:** IM 11.25 mg q4wk
**Child ≤25 kg:** 7.5 mg q4wk

**Available forms:** Depot inj: 3.75, 7.5, 11.25, 15, 22.5, 30, 45 mg; Inj: 5 mg/ml (2.8 ml multidose vials)

### Implementation

- Never give IV
- Store in tight container at room temp
- Use depot only IM; never give SUBCUT
- Unused vials may be stored at room temperature

**Subcut route**

- No dilution needed; if patient is self-administering make sure patient uses syringes provided by manufacturer
- **Eligard subcut:** Bring to room temp, once mixed give within 30 min; prepare the 2 syringes for mixing, join the 2 syringes by pushing in and twisting until secure; mix the product by pushing the contents of both syringes back and forth between syringes until uniform, should be light tan to tan; hold syringes vertically with syringe B on the bottom, draw entire mixed product into syringe B (short, wide syringe) by depressing the syringe A plunger and slightly withdrawing syringe B plunger, uncouple syringe A while pushing down on syringe A plunger, small air bubbles will remain; hold syringe B upright, remove pink cap, attach needle cartridge to the end of syringe B, remove needle cover, give by subcut route

**IM route**

- Never give IV
- **Give monthly:** reconstitute single-use vial with 1 ml of diluent; if multiple vials are used, withdraw 0.5 ml and inject into each vial (1 ml), withdraw all and inject at 90-degree angle (3.75 mg)
- **Give 3 month:** reconstitute microspheres using 1.5 ml of diluent and inject in vial, shake, withdraw and inject
- **12-month:** inserted into upper arm; at the end of 12 months, implant must be removed
- Use syringe and product packaged together; give deep in large muscle mass; rotate sites

## ADVERSE EFFECTS

**CNS:** Memory impairment, depression, seizures
**CV:** MI, pulmonary emboli, dysrhythmias, peripheral edema
**GI:** Anorexia, diarrhea, GI bleeding, nausea, vomiting
**GU:** Edema, hot flashes, impotence, decreased libido, amenorrhea, vaginal dryness, gynecomastia, profuse vaginal bleeding
**INTEG:** Alopecia
**MS:** Bone pain
**Prostate cancer:** Increased bone pain for the first 4 wk of treatment, those with metastases in spinal column might have severe back pain
**RESP:** Dyspnea, pulmonary fibrosis, interstitial lung disease

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed (SUBCUT) |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 3-4 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Flutamide, megestrol: increased antineoplastic action

### Drug/herb

Do not confuse with black cohosh or chaste tree fruit, may interfere with treatment

## NURSING CONSIDERATIONS

### Assessment

- **Prostate cancer:** Assess for increased bone pain during first 4 wk of treatment, those with metastasis in the spinal column may exhibit severe back pain
- **Assess for symptoms of endometriosis/fibroids** including lower abdominal pain, excessive vaginal bleeding, bloating if product is given for the diagnosis of endometriosis
- **For central precocious puberty (CPP):** the diagnosis should have been confirmed by development of secondary sex characteristics in children <9 yr; also included to confirm the diagnosis of CPP is estradiol/testosterone, GnRH test, tomography of head, adrenal steroid, chorionic gonadotropin, wrist x-ray, height, weight; patients with CPP display the signs of testicular growth, facial, body hair (boys), breast development, menses (girls)
- Monitor liver function tests before, during therapy (bilirubin, AST, ALT, LDH) as needed or monthly; prostate-specific antigen in prostate cancer; calcium, testosterone, bone mineral density, blood glucose, HbA1c
- Monitor pituitary gonadotropic and gonadal function during therapy and 4-8 wk after therapy is decreased; check LH, FSH, acid phosphate at beginning of treatment
- **Tumor flare:** monitor worsening of signs and symptoms (normal during beginning therapy): fatigue, increased pulse, pallor,

lethargy, edema in feet, joints, stomach pain, shaking
• Monitor renal status: I&O ratio, check for bladder distention daily during beginning therapy (renal obstruction)
• **Severe allergic reaction:** rash, pruritus, urticaria, purpuric skin lesions, itching, flushing

### Patient/family education
• Advise patient to notify prescriber if menstruation continues (menstruation should stop); to use a nonhormonal method of contraception during therapy
• **Pregnancy/breastfeeding:** Teach patient to notify prescriber if pregnancy is planned or suspected, avoid breastfeeding, to use a nonhormonal form of contraception (women of childbearing potential)
• Instruct patient to report any complaints, side effects to nurse or prescriber; hot flashes may occur; record weight, report gain of 2 lb/day
• Teach patient how to prepare, administer; to rotate sites for SUBCUT/IM inj; use only syringe provided by manufacturer; to store depot at room temperature, refrigerate unopened vials, to protect all from heat; to keep accurate records of dosing (prostate cancer)
• Instruct patient that tumor flare may occur: increase in size of tumor, increased bone pain; tell patient that bone pain disappears after 1 wk; may take analgesics for pain, usually in prostate cancer
• Advise the patient not to breastfeed while taking this product
• Inform patient that voiding problems may increase in beginning of therapy, but will decrease in several weeks
• Teach patient that ongoing treatment is needed to control precocious puberty

### Evaluation
**Positive therapeutic outcome**
• Decreased size, spread of malignancy
• Decreased pain in endometriosis, fibroids
• Decreased signs of CPP
• Increased follicle maturation

## levalbuterol (Rx)
(lev-al-bute′er-ole)
**Xopenex, Xopenex HFA**
*Func. class.:* Bronchodilator
*Chem. class.:* Adrenergic $\beta_2$-agonist

**ACTION:** Causes bronchodilatation by action on $\beta_2$ (pulmonary) receptors by increasing levels of cyclic adenosine monophosphate (AMP), which relaxes smooth muscle; produces bronchodilatation; CNS, cardiac stimulation, increased diuresis, and increased gastric acid secretion

**Therapeutic outcome:** Increased ability to breathe because of bronchodilatation

**USES:** Treatment or prevention of bronchospasm (reversible obstructive airway disease), asthma

## CONTRAINDICATIONS
Hypersensitivity to sympathomimetics, this product, or albuterol

**Precautions:** Pregnancy, breastfeeding, hyperthyroidism, diabetes mellitus, hypertension, prostatic hypertrophy, closed-angle glaucoma, seizures, renal disease, QT prolongation, tachydysrhythmias, severe cardiac disease, hypokalemia, children

## DOSAGE AND ROUTES
### Bronchospasm in reversible obstructive airway disease
**Adult and child ≥12 yr:** INH 0.63 mg tid, q6-8hr by nebulization; may increase to 1.25 mg q8hr
**Adult/adolescent/child >4 yr:** (HFA, metered dose) 90 mcg (2 INH) q4-6hr
**Child 6-11 yr:** INH 0.31 mg tid via nebulization, max 0.63 mg tid
### Asthma, relief (unlabeled)
**Child <4 yr:** nebulizer solution 0.31-1.25 in Nebsol 3 ml q4-6hr prn, or 0.075 mg/kg in Nebsol q20min × 3 doses, then 0.075-0.15 mg/kg up to 5 mg q1-4hr

**Available forms:** Inh pediatric 0.31 mg/3 ml; sol 0.63/3 ml, 1.25 mg/3 ml, 125 mg/0.5 ml, 45 mcg per actuation (HFA)

### Implementation
• Give by nebulization q6-8hr; wait at least 1 min between inhalation of aerosols
• Use this medication before other medications and allow 5 min between each to prevent overstimulation
• Keep unopened until ready for use, after opening, use within 2 wk, protect from light, heat
**Inhalation route**
• Shake well before use, use a spacer device, prime with 4 test sprays in new canister or when not used for >3 days
**Nebulizer route**
• Dilute conc sol with normal sterile saline (1.25 mg/0.5ml) before use

## ADVERSE EFFECTS
**CNS:** *Tremors, anxiety,* insomnia, headache, dizziness, stimulation, *restlessness,* weakness, irritability
**CV:** Palpitations, tachycardia, hypertension, angina, hypotension, dysrhythmias, QT prolongation

**EENT:** Dry nose, irritation of nose and throat
**GI:** Heartburn, nausea, vomiting, diarrhea, rhinitis
**INTEG:** Rash
**META:** Hypokalemia, hyperglycemia
**MS:** Muscle cramps
**RESP:** Cough, dyspnea
**SYST:** Anaphylaxis, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver extensively, tissues |
| **Excretion** | Unknown, breast milk |
| **Half-life** | Unknown |

### Pharmacodynamics

| | INH SOL | INH AEROSOL |
|---|---|---|
| **Onset** | 5-15 min | 4.5-10.2 min |
| **Peak** | 1½ hr | 76-78 min |
| **Duration** | 5-6 hr | 6 hr |

## INTERACTIONS

### Individual drugs

Haloperidol, chloroquine, droperidol, pentamidine, arsenic trioxide, levomethadyl: increased QT prolongation, Increase: hypokalemia: loop/thiazide diuretics

### Drug classifications

Adrenergics: increased levalbuterol action
β-Adrenergic blockers: decreased levalbuterol action, severe bronchospasm may occur
Bronchodilators (aerosol): increased action of bronchodilator
Class IA/III antidysrhythmics, some phenothiazines, beta agonists, local anesthetics, tricyclics, CYP3A4 inhibitors (amiodarone, clarithromycin, erythromycin, telithromycin, troleandomycin), CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone): increased QT prolongation
Loop/thiazide diuretics: increased hypokalemia
MAOIs: tricyclics, other adrenergics, increased levalbuterol action

### Drug/herb

Cola nut, guarana, tea (black/green), coffee, yerba maté: increased stimulation

## NURSING CONSIDERATIONS

### Assessment

- Assess cardiac status: palpitations, increased or decreased B/P, dysrhythmias
- **QT prolongation:** Monitor ECG for QT prolongation, ejection fraction; assess for chest pain, palpitations, dyspnea
- **Assess respiratory function:** vital capacity, pulse oximetry, forced expiratory volume, ABGs, lung sounds, heart rate, rhythm (baseline, during therapy); character of sputum: color, consistency, amount
- Determine that patient has not received theophylline therapy before giving dose, to prevent additive effect; client's ability to self-medicate
- Monitor for evidence of allergic reactions; paradoxic bronchospasm, anaphylaxis, angioedema; withhold dose; notify prescriber, if these occur hold dose, notify prescriber at once, bronchospasm may occur with new canister or vial
- **Pregnancy/breastfeeding:** Avoid use in pregnancy, do not breastfeed, unknown reaction

### Patient/family education

- Tell patient not to use OTC medications before consulting prescriber; extra stimulation may occur; instruct patient to use this medication before other medications and allow at least 5 min between each to prevent overstimulation; to limit caffeine products such as chocolate, coffee, tea, and cola or herbs such as cola nut, guarana, yerba maté
- Teach patient that if paradoxical bronchospasm occurs to stop product immediately and notify prescriber
- Teach patient to use this product first, if using other inhalers, wait 5 min or more between products; rinse mouth with water after each dose to prevent dry mouth
- **Inhaler:** Teach patient to shake well before using and to breathe normally while using and mist goes into the reservoir, to spray × 4 before first use or if not used for 3 days, wash at least weekly
- **Diabetes:** Teach patient that diabetes may be exacerbated, use other products for diabetes in addition if needed

### Evaluation

**Positive therapeutic outcome**

- Absence of dyspnea and wheezing after 1 hr
- Improved airway exchange
- Improved ABGs

## TREATMENT OF OVERDOSE:

Administer a $\beta_1$-adrenergic blocker

## levETIRAcetam (Rx)

(lev-ee-tye'ra-see-tam)
**Keppra, Keppra XR, Spirtam**
*Func. class.:* Anticonvulsant

**Do not confuse:** levETIRAcetam/lamoTRIgine/levOCARNitine/levoFLOXacin

**ACTION:** Unknown; may inhibit nerve impulses by limiting influx of sodium ions across cell membrane in motor cortex

**Therapeutic outcome:** Absence of seizures

**USES:** Adjunctive therapy in partial-onset seizures, primary generalized tonic-clonic seizures, myoclonic seizures in juvenile patients

## CONTRAINDICATIONS

Hypersensitivity, breastfeeding

**Precautions:** Pregnancy, children, geriatric, cardiac/renal disease, psychosis

## DOSAGE AND ROUTES

### Adjunctive treatment of partial seizures

**Adult and adolescent ≥16 yr: IV** 500 mg bid, may titrate by 1000 mg/day q2wk; max 3000 mg/day in divided doses; ext rel 1000 mg/day, may increase q2wk, max 3000 mg/day

**Adolescent <16 yr/child/infant:** PO 10 mg/kg bid, increase the daily dose q2wk, by 20 mg/kg to 30 mg/kg bid; if unable to tolerate, may reduce dose

### Myoclonic seizures/tonic-clonic seizures/partial seizures

**Adult and adolescent >16 yr:** PO/**IV** 500 mg bid, may increase by 1000 mg/day q2wk; max 3000 mg/day

### Adjunctive treatment of partial-onset seizure in those with epilepsy (Spirtam)

**Adult/child ≥ 4 yr and > 40 kg:** PO 500 mg bid, may increase q2wk by 500 mg bid, max 1500 mg bid

### Renal dose

**Adult:** PO CCr 50-80 ml/min, 500-1000 mg q12hr, ext rel 1000-2000 q24hr, max 2000 mg/day; CCr 30-49 ml/min, 250-750 mg q12hr, ext rel 500-1500 mg q24hr, max 1500 mg/day; CCr <30 ml/min 250-500 mg q12hr, ext rel 500-1000 mg q24hr, max 1000 mg/day

**Available forms:** Tabs 250, 500, 750, 1000; oral sol 100 mg/ml; SOL for inj 100 mg, 5 ml, ext rel tab 500, 750 mg; 1000 mg/100 ml 0.75% NaCl, 1500 mg/100 ml 0.54% NaCl, 500 mg/100 ml 0.82% NaCl; oral disintegrating tab 250, 500, 750, 1000 mg

### Implementation

**PO route**

- Ext rel product should not be used in dialysis patients
- Give with food, milk to decrease GI symptoms (rare)
- **Child <20 kg:** give oral sol, use calibrated device
- Store at room temperature (PO); diluted preparation stable for 24 hr at room temperature in polyvinyl bags

**Oral disintegrating tab**

- Give only whole tabs
- Peel foil from blister, do not push through foil
- Place on tongue and follow with a sip of liquid, do not swallow
- Tab can be added to a tablespoon of liquid, swirl gently, consume

**Intermittent IV route**

- Single-use vials: dilute in 100 mg of 0.9% NaCl, $D_5W$, LR; give over 15 min, discard unused vial contents, do not use product with particulates or discoloration

**Child:** Max concentration of product to be used 15 mg/ml (diluted solution) infuse over 15 min

- Store vials at room temperature

## ADVERSE EFFECTS

**CNS:** Dizziness, somnolence, asthenia, psychosis, suicidal ideation, non-psychotic behavioral symptoms, headache, ataxia
**EENT:** Diplopia, conjunctivitis
**GI:** Nausea, vomiting, anorexia, diarrhea, constipation, hepatitis
**HEMA:** Infection, leukopenia
**INTEG:** Pruritus, rash
**MISC:** Abdominal pain, pharyngitis, infection
**SYST:** Stevens-Johnson syndrome, toxic epidermal necrolysis, dehydration (child <4 yr)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Widely distributed, not protein bound |
| **Metabolism** | Liver, small amount |
| **Excretion** | Kidneys, 66% unchanged |
| **Half-life** | 6-8 hr, longer in renal disease/geriatric |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

CarBAMazepine: increased carBAMazepine toxicity

Sevelamer: decreased levetiracetam absorption; separate by 1 hr before, 3 hr after sevelamer

### Drug classifications

TCAs, antihistamines, benzodiazepines, other CNS depressants: increased sedation

### Drug/lab test

Decreased: Hct/Hgb, WBC, RBC

## NURSING CONSIDERATIONS

### Assessment

- Monitor urine function tests (BUN, urine protein) periodically during treatments
- Assess seizure activity including type, location, duration, and character, intensity, precipitating factors; provide seizure precautions
- Assess blood studies: CBC, LFTs
- **Assess mental status:** mood, sensorium, affect, behavioral changes, suicidal thoughts/behaviors
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, if used in pregnancy patient should enroll in the Antiepileptic Drug Pregnancy Registry 888-233-2334, do not breastfeed
- **Beers:** Avoid in older adults unless safer alternatives are not available, may cause ataxia, impaired psychomotor function

### Patient/family education

- Teach patient to carry/wear emergency ID stating patient's name, products taken, condition, prescriber's name, phone number
- Caution patient to avoid driving, other activities that require alertness until stabilized on medication, until response is known, drowsiness occurs during first month
- Teach patient not to discontinue medication quickly after long-term use
- Instruct patient to report suicidal thoughts, behaviors immediately, mood changes, hostility, thoughts of death/dying
- Teach patient to use a nonhormonal type of contraception
- Teach patient to take exactly as prescribed, do not double or omit doses
- Advise not to breastfeed, excreted in breast milk

### Evaluation

**Positive therapeutic outcome**

- Decreased seizure activity

## levobetaxolol ophthalmic

*See Appendix B*

## levobunolol ophthalmic

*See Appendix B*

## levocabastine ophthalmic

*See Appendix B*

## levodopa-carbidopa (Rx)

(lee-voe-doe'pa kar-bi-doe'pa)

**Apo-Levocarb, Duodopa, Rytary, Sinemet, Sinemet CR**

*Func. class.:* Antiparkinsonism agent

*Chem. class.:* Catecholamine

**ACTION:** Decarboxylation of levodopa in periphery is inhibited by carbidopa; more levodopa is made available for transport to brain and conversion to dopamine in the brain

**Therapeutic outcome:** Absence of involuntary movements

**USES:** Parkinson's disease, parkinsonism resulting from carbon monoxide, chronic manganese intoxication, cerebral arteriosclerosis, motor fluctuations in those with advanced Parkinson's disease

**Unlabeled uses:** Restless legs syndrome

## CONTRAINDICATIONS

Hypersensitivity, malignant melanoma, history of malignant melanoma, or undiagnosed skin lesions resembling melanoma

**Precautions:** Pregnancy, breastfeeding, diabetes, renal/cardiac/hepatic/respiratory disease, MI with dysrhythmias, open-angle glaucoma, seizures, peptic ulcer, depression

## DOSAGE AND ROUTES

### For the treatment of idiopathic Parkinson's disease, postencephalitic parkinsonism, and symptomatic parkinsonism that may follow injury to the nervous system by carbon monoxide intoxication and/or manganese intoxication

**Adult: PO (immediate-release tablets):** Initial treatment: 1 carbidopa 25 mg/levodopa 100 mg tablet tid, may increase by 1 tablet qday or every other day max of 8 tablets/day. If carbidopa 10 mg/levodopa 100 mg is used, may start with 1 tablet three or four times a day. **MAINTENANCE TREATMENT:** Individualize and adjust dosing regimen according to response and tolerability. At least 70 mg to 100 mg of carbidopa per day should be used. When a greater proportion of carbidopa is required, 1 tablet of carbidopa 25 mg/levodopa 100 mg may be substituted for each

carbidopa 10 mg/levodopa 100 mg tablet. **PO (extended-release tablets – Sinemet CR): Initial Treatment:** carbidopa 50 mg/levodopa 200 mg tablet bid, most have been use extended-release tablets 400 mg to 1600 mg of levodopa/ day. The dosing intervals should be 4 to 8 hr apart during the waking day, adjust dose at 3-day intervals. **Patients From Levodopa To Carbidopa-Levodopa:** Initiate at 25% of the previous dose of levodopa alone; in those with mild to moderate disease, the usual initial dosage is carbidopa 50 mg/levodopa 200 mg extended-release tablet twice daily. **Converting Patients From Immediate-Release Carbidopa-Levodopa To Extended-Release Carbidopa-Levodopa:** Substitute extended-release tablets at a dosage that provides approximately 10% more levodopa per day than the immediate-release tablets. The dosing intervals should be 4 to 8 hr apart during the waking day. For those receiving 300-400 mg/day of levodopa as immediate-release carbidopa-levodopa, start Sinemet CR carbidopa 50 mg/levodopa 200 mg bid, for patients receiving 500 mg/day to 600 mg/day of levodopa as immediate-release carbidopa-levodopa, start Sinemet CR carbidopa 50 mg/levodopa 200 mg tid **PO (extended-release capsules; Rytary) Adults Initial Treatment:** Rytary 23.75 mg/95 mg PO three times a day for the first 3 days. On day 4, may increase the dose to 36.25 mg/145 mg three times a day.

### For the treatment of motor fluctuations in patients with advanced Parkinson's disease

**Adults: Enteral suspension dosage (nasojejunal tube for short-term administration or PEG-J for long-term administration)** Before initiating the enteral suspension on day 1, convert patients from all other forms of levodopa to oral immediate-release carbidopa/levodopa tablets (1:4 ratio). Patients should remain on a stable dose of their concomitant medications taken for the treatment of Parkinson's disease before initiation of the carbidopa/levodopa suspension via enteral pump. Health care providers should ensure patients take their oral Parkinson's disease medications the morning of the PEG-J procedure. The daily enteral suspension dose can be titrated as needed, based on response and tolerability, after day 1 and until a stable daily dose is maintained. The maximum recommended daily dose of carbidopa/levodopa enteral suspension is 2000 mg of the levodopa component (i.e., 1 cassette per day) administered over 16 hr. At the end of each daily 16-hr infusion, patients will disconnect the pump from the PEG-J and take their nighttime dose of oral immediate-release carbidopa-levodopa tablets. DAY 1 MORNING DOSING: Determine the total amount of levodopa in milligrams (mg) in the first dose of oral immediate-release carbidopa/levodopa that was taken by the patient on the previous day. Convert the oral levodopa dose from milligrams (mg) to milliliters (ml) by multiplying the oral dose by 0.8 and then dividing by 20 mg/ml. This calculation will provide the morning dose of carbidopa/levodopa suspension in milliliters. Add 3 ml to the morning dose to fill (prime) the intestinal tube to obtain the total morning dose. Program the pump to deliver the total morning dose, which is usually administered over 10 to 30 min. DAY 1 CONTINUOUS DOSING: Determine the amount of oral immediate-release levodopa that the patient received from oral immediate-release carbidopa-levodopa doses throughout the previous day (16 waking hr), in milligrams (mg). Do not include the doses of oral immediate-release carbidopa-levodopa taken at night when calculating the levodopa amount. Subtract the first oral levodopa dose in milligrams (mg) taken by the patient on the previous day from the total oral levodopa dose in milligrams (mg) taken over 16 waking hr. Divide the result by 20 mg/ml. This is the dose of carbidopa/levodopa suspension administered as a continuous dose (in ml) over 16 hr. The hourly infusion rate (ml per hour) is obtained by dividing the continuous dose by 16 hr. The hourly infusion rate will be programmed into the pump as the continuous rate. If persistent or numerous "off" periods occur during the 16-hr infusion, consider increasing the continuous dose or using the extra dose function. If dyskinesia or levodopa-related adverse reactions occur, consider decreasing the continuous dose or stopping the infusion until the adverse reactions subside. **Morning Dose Adjustments:** If there was an inadequate response within 1 hr of the morning dose on the prior day, adjust the morning dose (excluding the 3 ml to fill the tube) as follows: If the morning dose on the prior day was less than or equal to 6 ml, increase the morning dose by 1 ml. If the morning dose on the preceding day was greater than 6 ml, increase the morning dose by 2 ml. If the patient experienced dyskinesias or levodopa-related adverse reactions within 1 hr of the morning dose on the prior day, decrease the morning dose by 1 ml. **Continuous Dose Adjustments:** Consider increasing the continuous dose based on the number and volume of extra

doses of carbidopa/levodopa (i.e., total amount of levodopa component) that was needed for the previous day and the patient's clinical response. Consider decreasing the continuous dose if the patient experienced troublesome dyskinesia or other troublesome treatment-related adverse reactions on the preceding day as follows: For troublesome adverse reactions lasting 1 hr or more, decrease the continuous dose by 0.3 ml/hour. For troublesome adverse reactions lasting for two or more periods of 1 hr or more, decrease the continuous dose by 0.6 ml/hr. EXTRA DOSES: The enteral infusion pump has an extra dose function that can be used to manage acute "off" symptoms that are not controlled by the morning dose and the continuous dose administered over 16 hr. The extra dose function should be set at 1 ml (20 mg of levodopa) when starting the enteral suspension. If the amount of the extra dose needs to be adjusted, it is typically done in 0.2-ml increments. The extra dose frequency should be limited to one extra dose every 2 hr. Administration of frequent extra doses may cause or worsen dyskinesias. **Treatment Discontinuation:** Avoid sudden discontinuation or rapid dose reduction. If discontinuation is needed, the dose should be tapered or patients should be switched to oral immediate-release carbidopa/levodopa tablets. When using a PEG-J tube, the drug can be discontinued by withdrawing the tube and letting the stoma heal. The removal of the tube should only be performed by a qualified health care provider

### For the treatment of restless legs syndrome (RLS) (unlabeled)

**Adult: PO** A bedtime dose of immediate-release carbidopa/levodopa starting at 25 mg/100 mg. Levodopa dosages as high as 600 mg/day in divided doses have been used. Dosages may be increased rapidly based on individual response and are usually given before bedtime

**Available forms:** Tabs 10 mg carbidopa/100 mg levodopa, 25 mg carbidopa/100 mg levodopa, 25 mg carbidopa/250 mg levodopa; ext rel tab 25 mg/100 mg, 50 mg/200 mg carbidopa/levodopa (Sinemet CR); oral disintegrating tab (Parcopa) 10 mg carbidopa/100 mg levodopa, 25 mg carbidopa/100 mg levodopa, 25 mg carbidopa/250 mg levodopa; ext rel caps (Rytary) 23.75 mg/95 mg, 36.25 mg/145 mg, 48.75/195 mg, 61.25/245 mg; enteral suspension (Duopa) levodopa 20 mg/ml/4.63 mg/ml carbidopa

### Implementation

**PO route**

- Swallow **ext rel tabs** whole; do not break, crush, or chew
- **Oral disintegrating tab:** gently remove from bottle, place on tongue, swallow with saliva; after it dissolves, liquid is not necessary
- Give product until NPO before surgery; check with prescriber for continuing product
- Adjust dosage depending on patient response
- Give with meals or after meals to prevent GI symptoms; limit protein taken with product
- Give only after MAOIs have been discontinued for 2 wk; if previously on levodopa, discontinue for at least 8 hr before change to levodopa-carbidopa

**Enteral route**

- Fully thaw in refrigerator, remove one cassette from refrigerator, 20 min before to use, give through NG tube or a percutaneous endoscopic gastronomy tube connected to the CADD - Legacy 1400 pump, disconnect after use and flush with water, cassettes are single use only, label in order to be used based on date

## ADVERSE EFFECTS

**CNS:** *Involuntary choreiform movements, hand tremors, fatigue, headache, anxiety, twitching, numbness, weakness, confusion, agitation, insomnia, nightmares,* psychosis, hallucination, hypomania, severe depression, dizziness, impulsive behaviors, neuroleptic malignant syndrome, suicidal ideation
**CV:** *Orthostatic hypotension,* tachycardia, hypertension, palpitation, MI
**EENT:** Blurred vision, diplopia, dilated pupils
**GI:** *Nausea, vomiting, anorexia, abdominal distress, dry mouth, flatulence, dysphagia, bitter taste, diarrhea, constipation,* GI bleeding
**HEMA:** Hemolytic anemia, leukopenia, agranulocytosis, thrombocytopenia
**INTEG:** Rash, sweating, alopecia
**MISC:** Urinary retention, incontinence, weight change, dark urine, increased libido, hypersensitivity, dark sweat

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO); ER dose slowly absorbed |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys, metabolites |
| **Half-life** | Levodopa (1 hr); carbidopa (1-2 hr) |

### Pharmacodynamics

| | PO | PO-ER | Enteral |
|---|---|---|---|
| **Onset** | Unknown | Unknown | |
| **Peak** | 1 hr | 2½ hr | 2.5 hr |
| **Duration** | 6-24 hr | Unknown | |

## INTERACTIONS

### Individual drugs

Metoclopramide: increased effects of levodopa
Papaverine, pyridoxine: decreased effects of levodopa

### Drug classifications

Antacids: increased effects of levodopa
Anticholinergics, antipsychotics, benzodiazepines, hydantoins: decreased effects of levodopa
Antihypertensives: Increased: Hypotension
MAOIs: hypertensive crisis

### Drug/food

Protein: decreased absorption of levodopa

### Drug/lab test

Increased: AST, ALT, bilirubin, LDH, alkaline phosphatase, BUN, serum glucose
Decreased: BUN, creatinine, uric acid
False increase: urine protein
False positive: urine ketones (dipstick), Coombs' test
False negative: urine glucose

## NURSING CONSIDERATIONS

### Assessment

- Parkinsonism: Assess for shuffling gait, muscle rigidity, involuntary movements, pill rolling, muscle spasms, drooling before and during treatment
- Assess B/P, respiration, orthostatic B/P
- Monitor I&O ratio; retention commonly causes decreased urinary output, distention, frequency, incontinence; palpate bladder if retention occurs
- Assess for muscle twitching, blepharospasm that may indicate toxicity
- Monitor renal, liver, hematopoietic studies; also for diabetes, acromegaly during long-term therapy
- Monitor for constipation, cramping, pain in abdomen, abdominal distention; increase fluids, bulk, exercise if this occurs
- Assess for tolerance over long-term therapy; dose may have to be increased or changed
- Assess for mental status: affect, mood, CNS depression, worsening of mental symptoms during early therapy
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, product is excreted in breast milk

### Patient/family education

- Teach patient to change positions slowly to prevent orthostatic hypotension, especially during beginning of treatment
- Teach patient to report side effects: twitching, eye spasms, grimacing, protrusion of tongue, personality changes that indicate overdose
- Instruct patient to use product exactly as prescribed; if product is discontinued abruptly, parkinsonian crisis may occur; do not double doses; take missed dose as soon as remembered up to 2 hr before next dose
- Teach patient that urine, sweat may darken and is harmless
- Advise patient to use physical activities to maintain mobility and lessen spasms
- Instruct patient that OTC medications should not be used unless approved by prescriber
- Advise patient that drowsiness, dizziness are common; to avoid hazardous activities until response is known
- Explain that sips of water, hard candy, or gum may lessen dry mouth
- Teach patient to take with meals to prevent GI symptoms; to limit protein intake, which impairs product's absorption
- Teach patient not to chew, crush extended-release product
- Teach patient to immediately report nausea, vomiting, abdominal pain, ongoing constipation if using enteral product
- Teach patient to use ODT immediately after removing from container, to dissolve on tongue, swallow with saliva
- Teach patient to take as prescribed, not to take double doses

### Evaluation

**Positive therapeutic outcome**

- Decrease in akathisia
- Improved mood
- Decreased involuntary movements

## levofloxacin (Rx)

(lev-o-floks'a-sin)
**Levaquin**
*Func. class.:* Antiinfective
*Chem. class.:* Fluoroquinolone antibacterial

**Do not confuse:** Levaquin/Larium, levoFLOXacin/levetiracetam

**ACTION:** Interferes with conversion of intermediate DNA fragments into high molecular weight DNA in bacteria; DNA gyrase inhibitor; inhibits topoisomerase IV

**Therapeutic outcome:** Bacteriocidal action against the following: *Streptococcus pneumoniae, Streptococcus pyogenes, Haemophilus influenzae, Haemophilus parainfluenzae, Moraxella catarrhalis, Klebsiella pneumoniae, Mycoplasma pneumoniae, Escherichia coli, Serratia marcescens, Chlamydia pneumoniae, Legionella pneumophila,*

*Enterococcus faecalis, Staphylococcus epidermidis, Staphylococcus pyogenes, Staphylococcus aureus, Bacillusanthracis*

**USES:** Acute sinusitis, acute chronic bronchitis, community-acquired pneumonia, uncomplicated skin infections, UTI, cellulitis, prostatitis, inhalational anthrax (postexposure), acute pyelonephritis, inhalation anthrax in children

## CONTRAINDICATIONS

Hypersensitivity to quinolones

**Precautions:** Pregnancy, breastfeeding, children; photosensitivity, acute MI, atrial fibrillation, colitis, dehydration, diabetes, QT prolongation, myasthenia gravis, renal disease, seizure disorder, syphilis

**BLACK BOX WARNING:** Tendon pain/rupture, tendinitis, myasthenia gravis, neurotoxicity

## DOSAGE AND ROUTES

### Acute bacterial exacerbation of chronic bronchitis

**Adult:** PO/**IV** 500 mg q24hr × 7 days

### Acute bacterial sinusitis

**Adult:** PO 500 mg q24hr × 10-14 days or 750 mg q24hr × 5 days

### Mild-moderate UTI/acute pyelonephritis

**Adult:** PO/**IV** 750 mg q24hr × 5 days or 250 mg q24hr × 10 days

### Chronic bacterial prostatitis

**Adult:** PO 500 mg q24hr × 28 days

### Postexposure inhalational anthrax

**Adult/adolescent/child >50 kg:** PO/**IV** 500 mg q24hr × 60 days

**Infant >6 mo and child <50 kg:** **IV** 8 mg/kg q12hr × 60 days, max 250 mg/dose

### Pneumonia, community acquired

**Adult:** PO/**IV** 500 mg q24hr × 7-14 days or 750 mg q24hr × 5 days

### Pneumonia, nosocomial

**Adult:** PO/**IV** 750 mg q24hr × 7-14 days

### SSSI, complicated

**Adult:** PO/**IV** 750 mg q24hr × 7-14 days

### SSSI, uncomplicated

**Adult:** PO 500 mg q24hr × 7-10 days

### UTI, complicated

**Adult:** PO/**IV** 750 mg q24hr × 5 days or 250 mg q24hr × 10 days

### UTI, uncomplicated

**Adult:** PO 250 mg q24hr × 3 days

### Plague *(Yersinia pestis)*

**Adult:** PO/**IV** 500 mg q24hr × 10-14 days (with pneumonia, 750 mg q24hr)

**Adolescent/child <50 kg:** PO/**IV** 8 mg/kg (max 250 mg/dose) q12hr × 10-14 days

### Renal disease

**Adult:** PO/IV CCr 20-49 ml/min: for 750-mg dose, give 750 mg q48hr; for 500-mg dose, give 500 mg once, then 250 mg q24hr; for 250-mg dose, no adjustment; CCr 10-19 ml/min: for 750-mg dose, give 750 mg once, then 500 mg q48hr; for 500-mg dose, give 500 mg once, then 250 mg q48hr; for 250-mg dose, give 250 mg q48hr, except when treating complicated UTI, then no dose adjustment

**Available forms:** Single-use vials (500, 750 mg), premixed flexible container; 250 mg/50 ml $D_5W$, 500 mg/100 ml $D_5W$, 750 mg/150 ml $D_5W$; tabs 250, 500, 750 mg; oral sol 25 mg/ml

### Implementation

- Obtain C&S before treatment and periodically to determine resistance to this product
- Give PO 2 hr before or 2 hr after antacids, iron, calcium, zinc, sucralfate; give fluids
- Check for irritation, extravasation, phlebitis daily

**Oral solution**

- Give 1 hr prior to or 2 hr after food

**Intermittent IV infusion route**

- Discard any unused sol in the single-dose vial
- Visually inspect for particulate matter/discoloration prior to use

**IV (single use vial)**

- **500 mg/20 ml vials:** To prepare a dose of 500 mg, withdraw 10 ml from a 20-ml vial and dilute with a compatible IV solution ($D_5W$, NS) to a total volume of 50 ml. To prepare a 500-mg dosage, withdraw all 20 ml from the vial and dilute with a compatible IV solution to a total volume of 100 ml
- **750 mg/30 ml vials:** To prepare a dose of 750 mg, withdraw 30 ml from a 30-ml vial and dilute with a compatible intravenous solution ($D_5W$, NS) to a total volume of 150 ml
- The concentration of the diluted solution should be 5 mg/ml prior to administration. Solutions contain no preservatives; any unused portions must be discarded
- **Storage:** The diluted solution may be stored for up to 72 hours when stored at or below 25° C (77° F) or for 14 days when stored under refrigeration at 5° C (41° F) in plastic containers. Solutions may be frozen for up to 6 months (−20° C or −4° F) in glass bottles or plastic containers. Thaw frozen solutions

at room temperature (25° C or 77° F) or in a refrigerator (8° C or 46° F). Do not force thaw by microwave or water bath immersion. Do not refreeze after initial thawing

**Premixed IV solution**

• No dilution is necessary

**Intermittent IV injection**

• Infuse doses of ≤500 mg IV over 60 minutes and doses of 750 mg IV over 90 minutes. Shorter infusions or bolus injections should be avoided because of the risk of hypotension

**Y-site compatibilities:** Alemtuzumab, alfentanil, amifostine, amikacin, aminocaproic acid, aminophylline, ampicillin, ampicillin-sulbactam, anidulafungin, argatroban, atenolol, atracurium, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, busulfan, butorphanol, caffeine citrate, calcium gluconate, CARBOplatin, carmustine, caspofungin, cefepime, cefoTEtan, ceftaroline, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chlorproMAZINE, cimetidine, cisatracurium, CISplatin, clindamycin, codeine, cyclophosphamide, cycloSPORINE, cytarabine, dacarbazine, DACTINomycin, DAPTOmycin, DAUNOrubicin liposomal, dexamethasone, dexrazoxane, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doripenem, doxacurium, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, filgrastim, floxuridine, fluconazole, fludarabine, foscarnet, fosphenytoin, gallium, gemcitabine, gemtuzumab, gentamicin, granisetron, haloperidol, hydrocortisone, HYDROmorphone, IDArubicin, ifosfamide, imipenem-cilastatin, irinotecan, isoproterenol, labetalol, lepirudin, leucovorin, levorphanol, lidocaine, linezolid, mannitol, mechlorethamine, meperidine, mesna, methylPREDNISolone, metoclopramide, metroNIDAZOLE, midazolam, milrinone, minocycline, mitoMYcin, mitoXANtrone, mivacurium, morphine, mycophenolate mofetil, nalbuphine, naloxone, nesiritide, netilmicin, niCARdipine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, PEMEtrexed, penicillin G sodium, pentamidine, phenylephrine, plicamycin, potassium acetate/chloride, promethazine, propranolol, quinupristin-dalfopristin, ranitidine, remifentanil, rocuronium, sargramostim, sodium bicarbonate, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, tacrolimus, teniposide, theophylline, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, topotecan, trimethobenzamide, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

**Solution compatibilities:** 0.9% NaCl, $D_5W$, $D_5$/0.9% NaCl, $D_5LR$, $D_5$/0.45% NaCl, sodium lactate, plasma-lyte 56/$D_5W$

## ADVERSE EFFECTS

**CNS:** *Headache,* dizziness, *insomnia,* anxiety, seizures, *encephalopathy,* paresthesia, pseudotumor cerebri

**CV:** Chest pain, palpitations, vasodilatation, QT prolongation, hypotension (rapid infusion)

**EENT:** Dry mouth, visual impairment, tinnitus

**GI:** *Nausea,* flatulence, *vomiting,* diarrhea, abdominal pain, pseudomembranous colitis, hepatotoxicity, esophagitis, pancreatitis

**GU:** Vaginitis, crystalluria

**HEMA:** Eosinophilia, hemolytic anemia, lymphopenia

**INTEG:** Rash, pruritus, photosensitivity, epidermal necrolysis, injection site reaction, edema

**MISC:** Hypoglycemia, hypersensitivity, tendon rupture, rhabdomyolysis

**RESP:** Pneumonitis

**SYST:** Anaphylaxis, multisystem organ failure, Stevens-Johnson syndrome, angioedema, toxic epidermal necrolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Excretion** | Kidneys unchanged |
| **Half-life** | 6-8 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Immediate |
| **Peak** | Infusion's end |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Calcium, iron, sucralfate, zinc: decreased absorption of levofloxacin, give 2 hr before or after products

Foscarnet: increased CNS stimulation, seizures

Haloperidol, chloroquine, droperidol, pentamidine, arsenic trioxide, levomethadyl: increased QT prolongation

Magnesium: decreased levofloxacin absorption; do not use in same **IV** line

Probenecid: increased levofloxacin levels

Theophylline: decreased theophylline clearance; toxicity may result

Warfarin: increased bleeding, monitor coagulation studies (INR/PT)

### Drug classifications

Antacids (magnesium, aluminum): decreased absorption of levofloxacin

**BLACK BOX WARNING:** Corticosteroids: increased tendon rupture, assess for tendon pain

Class IA/III antidysrhythmics, some phenothiazines, beta agonists, local anesthetics, tricyclics, CYP3A4 inhibitors (amiodarone, clarithromycin, erythromycin, telithromycin, troleandomycin), CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone): increased QT prolongation, avoid using together

NSAIDs, cycloSPORINE: increased CNS stimulation, seizures

### Drug/lab test

Increased: PT, INR

Decreased: glucose, lymphocytes

### Drug/herb

Increase: Photosensitivity: St. John's wort

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for previous sensitivity reaction to quinolones
- Infection: **Assess patient for signs and symptoms of infection,** including characteristics of wounds, sputum, urine, stool, WBC $>10{,}000/mm^3$, fever; baseline, during treatment
- Obtain C&S before beginning product therapy to identify if correct treatment has been initiated
- **QT prolongation:** Monitor for QT prolongation, ejection fraction; assess for chest pain, palpitations, dyspnea
- **Pseudomembranous colitis:** Assess for diarrhea, abdominal pain, fever, fatigue, anorexia; possible anemia, elevated WBC and low serum albumin; stop product and give usually either vancomycin or IV metroNIDAZOLE
- **Assess for allergic reactions and anaphylaxis:** rash, urticaria, pruritus, chills, fever, joint pain; may occur a few days after therapy begins; EPINEPHrine and resuscitation equipment should be available for anaphylactic reaction
- Determine urine output; if decreasing, notify prescriber (may indicate nephrotoxicity); also check for increased BUN, creatinine

**BLACK BOX WARNING: Myasthenia gravis:** Do not use this product, may lead to life-threatening weakness of the respiratory muscles

**BLACK BOX WARNING: Neurotoxicity:** May occur within hours to weeks after starting use, may be irreversible, avoid use in those who have experienced peripheral neuropathy, numbness, tingling, burning in extremities report immediately to prescriber

- Monitor blood tests: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test monthly if patient is on long-term therapy
- Monitor electrolytes: potassium, sodium, chloride monthly if patient is on long-term therapy
- Monitor for bleeding: ecchymosis, bleeding gums, hematuria, stool guaiac daily if on long-term therapy
- **Assess for overgrowth of infection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum

**BLACK BOX WARNING: Tendon rupture:** Discontinue product at first sign of tendon pain or inflammation; usually the Achilles tendon is affected, can occur up to a few months after treatment and may require surgical repair; steroids may increase risk, elderly transplant patients

### Patient/family education

- Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate **blood dyscrasias (rare)**
- **Superinfection:** Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur, purulent discharge in stool
- Instruct patient to take all medication prescribed for the length of time ordered; product must be taken around the clock to maintain blood levels; do not give medication to others
- Advise patient to notify prescriber of diarrhea with blood or purulent discharge in stool
- Instruct patient to take 2 hr before antacids, iron, calcium, zinc products
- Tell patient to complete full course of therapy; to increase fluid intake to 2 L/day to prevent crystalluria
- Advise patient to avoid hazardous activities until response to product is known

• Instruct patient to rinse mouth frequently and use sugarless candy or gum for dry mouth
• Instruct patient to avoid taking other medications unless approved by prescriber
• Teach patient to monitor glucose (diabetes), notify provider of changes
• Advise patient to avoid sun exposure or use sunscreen to prevent phototoxicity

**BLACK BOX WARNING:** Teach patient to notify prescriber of tendon pain, inflammation, avoid corticosteroids with this product

### Evaluation

**Positive therapeutic outcome**
• Absence of signs/symptoms of infection (WBC $<10{,}000/mm^3$, temp WNL)
• Reported improvement in symptoms of infection

## levofloxacin ophthalmic

*See Appendix B*

## levomilnacipran

(lee′voe-mil-na′si-pran)
**Fetzima, milnacipran**
*Chem. class.:* Antidepressant
*Func. class.:* Serotonin norepinephrine reuptake inhibitor (SNRI)

**ACTION:** May potentiate serotonergic, andrenergic activity in the CNS; is a potent inhibitor of adrenal serotonin and norepinephrine reuptake

**Therapeutic outcome:** Decreased depression

**USES:** Major depressive disorder in adults

### CONTRAINDICATIONS

Alcohol intoxication, alcoholism, closed angle glaucoma, hepatic disease, hepatitis, jaundice, hypersensitivity

**Precautions:** Pregnancy, breastfeeding, geriatric patients, mania, hypertension, renal/cardiac disease, seizures, increased intraocular pressure, anorexia, bleeding, dehydration, diabetes, hypotension, hypovolemia, orthostatic hypotension, abrupt product withdrawal

**BLACK BOX WARNING:** Children, suicidal ideation

### DOSAGE AND ROUTES

**Major depressive disorder (levomilnacipran)**
**Adult: PO** 20 mg/day × 2 days, then 40 mg/day, may increase in increments of 40 mg at intervals of at least 2 days, max 120 mg/day; max 80 mg/day (strong CYP3A4 inhibitors therapy)

**Major depressive disorder (milnacipran)**
**Adult:** PO 12.5-25 mg bid, may titrate up to 100 mg bid, max 200 mg/day

**Renal dose**
**Adult:** PO CCr 30-59 ml/min, max 80 mg/day; 15-29 ml/min, max 40 mg/day; <15 ml/min, avoid use

**Fibromyalgia (levomilnacipran)**
**Adult/adolescent ≥ 17 yr:** PO 12.5 mg once on day 1, then 12.5 mg bid on days 2-3, then 25 mg bid on day 4-7 and 50 mg bid thereafter

**Fibromyalgia (Sarella) (milnacipran)**
**Adult:** PO 12.5 mg qday, increase by 12.5 mg bid on days 4 to 7, increase to 50 mg bid after day 7, may increase to 100 mg bid as needed

**Renal dose**
**Adult:** PO CCr 5-29 ml/min reduce maintenance dose by 50% (25-50 mg) bid

**Available forms:** Ext rel caps 20, 40, 80, 120 mg; tabs 12.5, 25, 50, 100 mg

### Implementation

• Swallow cap whole; do not break, crush, or chew; do not sprinkle on food or mix with liquid
• Give without regard to food
• Give at the same time of day

### ADVERSE EFFECTS

**CNS:** Dizziness, agitation, hallucinations, seizures, drowsiness, mania, migraine, paresthesias, suicidal ideation, syncope
**CV:** Hypertension, palpitations, dysrhythmia, sinus tachycardia
**EENT:** Teeth grinding, blurred vision
**GI:** Constipation, diarrhea, nausea, vomiting, anorexia, dry mouth, abdominal pain
**GU:** Urinary retention
**SYST:** Serotonin syndrome, Stevens-Johnson syndrome

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 22% protein binding |
| **Metabolism** | By CYP2D6 in the liver |
| **Excretion** | Unknown |
| **Half-life** | 12 hr |

#### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 6-8 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Linezolid, methylene blue IV: do not use concurrently

### Drug classifications

Anticoagulants, antiplatelets, NSAIDs, salicylates: increased bleeding risk

Antipsychotics, dopamine antagonists: Increased neuroleptic malignant syndrome, avoid using together

CYP34A inhibitors: increased levomilnacipran effect

MAOIs: Coadministration contraindicated within 14 days of MAOI

SSRIs, serotonin receptor agonists, SNRIs: increased serotonin syndrome

### Drug/herb

Alfalfa, feverfew, dong quai, fish oil: Increased bleeding risk

## NURSING CONSIDERATIONS

### Assessment

- **Serotonin syndrome:** assess for nausea/vomiting, dizziness, facial flush, shivering, sweating

**BLACK BOX WARNING: Depression:** assess mood, sensorium, affect, suicidal tendencies, increase in psychiatric symptoms, depression, panic; monitor children qwk face to face during first 4 wk or dosage change, then every other week for the next 4 wk, then at 12 wk

- **Beers:** Use with caution in older adults, may exacerbate or cause SIADs, monitor for hyponatremia
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, SSRIs should not be used in the third trimester, do not breastfeed
- Monitor B/P lying, standing; pulse q4hr; if systolic B/P drops 20 mm Hg, hold product, notify prescriber; take VS q4hr in patients with CV disease
- Hepatic studies: monitor AST ALT, bilirubin
- Withdrawal symptoms: assess for headache, nausea, vomiting, muscle pain, weakness; not common unless product is discontinued abruptly

### Patient/family education

- Teach patient signs and symptoms of bleeding (GI bleeding, nosebleed, ecchymoses, bruising)
- Instruct patient to use caution when driving and in other activities requiring alertness because of drowsiness and blurred vision
- Instruct patient to avoid alcohol ingestion, MAOIs, other CNS depressants, to notify all providers of use of this product
- Instruct patient not to discontinue medication quickly after long-term use; may cause headache, malaise; taper

**BLACK BOX WARNING:** Teach patient that clinical worsening and suicidal risk may occur, to notify prescriber immediately if suicidal thoughts/behaviors, aggression, panic attacks occur

**BLACK BOX WARNING: Serotonin syndrome:** Teach patient to report immediately nausea, vomiting, dizziness, facial flush, shivering, sweating

- Teach patient to notify prescriber if pregnancy is planned or suspected, or if breastfeeding
- Teach patient improvement may occur in 4-8 wk or up to 12 wk (geriatric patients)
- Teach patient to swallow caps whole, do not break, crush, chew
- Advise patient that product may be used without food

### Evaluation

**Positive therapeutic outcome**

- Decreased depression

## levothyroxine (Rx)

(lee-voe-thye-rox'een)

**Eltroxin, Euthyrox, Levothroid, Levo-TB, Levoxyl, Synthroid, Tirosint, Unithroid**

*Func. class.:* Thyroid hormone

*Chem. class.:* Levoisomer of thyroxine

**Do not confuse:** Synthroid/Symmetrel, levothyroxine/lamatrigine/Lanoxin/liothyronine

**ACTION:** Controls protein synthesis; increases metabolic rate, cardiac output, renal blood flow, $O_2$ consumption, body temp, blood volume, growth, development at cellular level via action on thyroid hormone receptors

**Therapeutic outcome:** Correction of lack of thyroid hormone

**USES:** Hypothyroidism, myxedema coma, thyroid hormone replacement, thyrotoxicosis, congenital hypothyroidism, some types of thyroid cancer, pituitary TSH suppression

## CONTRAINDICATIONS

Adrenal insufficiency, recent MI, thyrotoxicosis, hypersensitivity to beef, alcohol intolerance (inj only)

**BLACK BOX WARNING:** Obesity treatment

**Precautions:** Pregnancy, breastfeeding, geriatric, angina pectoris, hypertension, ischemia, cardiac disease, diabetes

## DOSAGE AND ROUTES NTI

### Severe hypothyroidism

**Adult ≤50 yr:** PO 1.7 mcg/kg/day, 6-8 wk, average dose 100-200 mcg/day; IM/**IV** 50-100 mcg/day as a single dose or 50% of usual oral dosage

**Adult >50 yr without heart disease or <50 yr with heart disease:** PO 25-50 mcg/day, titrate q6-8wk

**Adult >50 yr with heart disease:** PO 12.5-25 mcg/day, titrate by 12.5-25 mcg q6-8wk

**Child:** PO (puberty complete) 1.7 mcg/kg/day

**Child >12 yr:** PO (incomplete puberty) 2-3 mcg/kg/day given as a single dose AM

**Child 6-12 yr:** PO 4-5 mcg/kg/day given as a single dose AM

**Child 1-5 yr:** PO 5-6 mcg/kg/day given as a single dose AM

**Child 6-12 mo:** PO 6-8 mcg/kg/day given as a single dose AM

**Child 3-6 mo:** PO 8-10 mcg/kg/day given as a single dose AM

### Myxedema coma

**Adult:** **IV** 300-500 mcg; may increase by 100-300 mcg after 24 hr; give oral medication as soon as possible

### Subclinical hypothyroidism

**Adult:** PO 1 mcg/kg/day may be sufficient

**Available forms:** Powder for inj 100, 200, 500 mcg/vial; tabs 25, 50, 88, 100, 112, 125, 137, 150, 175, 200, 300; cap (liquid filled) 13, 25, 50, 75, 88, 100, 112, 125, 137, 150 mcg

### Implementation

- Store in tight, light-resistant container; sol should be discarded if not used immediately
- Withdraw medication 4 wk before RAIU test

**PO route**

- Give in AM if possible as a single dose to decrease sleeplessness; give at same time each day to maintain product level
- Give crushed and mixed with water, nonsoy formula (decreased absorption), or breast milk for infants/children, give by spoon or dropper, may crush and sprinkle over food
- Give only for hormone imbalances; not to be used for obesity, male infertility, menstrual conditions, lethargy; give lowest dosage that relieves symptoms; lower dosage for geriatric and in cardiac disease
- Use 8 oz of water with Levoxyl to prevent trouble breathing
- Separate antacids, iron, calcium products by 4 hr

**Direct IV route**

- Give **IV** after reconstituting with 5 ml normal saline injection (0.9% NaCl), 500 mcg/5 ml, 200 mcg/2 ml; shake well; give through Y-tube or 3-way stopcock; give 100 mcg or less over 1 min; do not add to **IV** infusion; considered incompatible in syringe with all other products

## ADVERSE EFFECTS

**CNS:** *Anxiety, insomnia, tremors,* headache, thyroid storm, excitability

**CV:** *Tachycardia, palpitations, angina, dysrhythmias,* hypertension, cardiac arrest

**GI:** Nausea, diarrhea, increased or decreased appetite, cramps

**MISC:** Menstrual irregularities, weight loss, sweating, heat intolerance, fever, alopecia, decreased bone mineral density

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Erratic (PO); complete (**IV**) |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver; enterohepatic recirculation |
| **Excretion** | Feces via bile; breast milk (small amounts) |
| **Half-life** | 6-7 days |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | 24 hr | |
| **Peak** | 12-48 hr | 12-48 hr |
| **Duration** | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Aluminum, calcium, iron, magnesium, sucralfate, rifampin, rifabutin: decreased levothyroxine effects

Orlistat, ferrous sulfate: decreased absorption of levothyroxine

### Drug classifications

Antacids: decreased levothyroxine effects

Anticoagulants (oral): increased anticoagulant effect, monitor coagulation studies (INR, PT)

Antidiabetics, insulin: Increased or decreased glucose levels, adjust levels

Bile acid sequestrants: decreased levothyroxine absorption

EPINEPHrine products: increased cardiac insufficiency risk

Estrogens: decreased thyroid hormone effects

Selective serotonin reuptake inhibitors, antileptics (carBAMazepine, OXcarbazepine, PHENobarbital, primidone, phenytoin); antimicrobials (rifAMPin, efavirenz, nevirapine, rifabutin, rifapentine): decreased levothyroxine effects
Sympathomimetics: increased sympathomimetic effect
Tricyclic/tetracyclic antidepressants: Increased effects of both products

### Drug/food
Fiber, walnuts: decreased product absorption, avoid concurrent use or adjust dose

### Drug/herb
Horseradish, Soy: decreased thyroid hormone effect

### Drug/lab test
Increased: CPK, LDH, AST, blood glucose
Decreased: thyroid function tests

## NURSING CONSIDERATIONS
### Assessment
- Determine if the patient is taking anticoagulants, antidiabetic agents; document on chart
- Take B/P, pulse before each dose; monitor I&O ratio and weight every day in same clothing, using same scale, at same time of day
- Monitor height, weight, psychomotor development, and growth rate if given to a child
- Monitor $T_3$, $T_4$, which are decreased; radioimmunoassay of TSH, which is increased; radioactive iodine uptake (RAIU), which is increased if patient's dosage of medication is too low
- Monitor pro-time (may require decreased anticoagulant); check for bleeding, bruising
- Assess for increased nervousness, excitability, irritability, which may indicate a too-high dosage of medication, usually after 1-3 wk of treatment
- Assess cardiac status: angina, palpitations, chest pain, change in VS; the geriatric patient may have undetected cardiac problems and baseline ECG should be completed before treatment
- **Anticoagulants:** Should be tested and dose adjusted as needed
- **CAD:** Monitor for coronary insufficiency, also watch for cardiac changes in those receiving high, rapid doses
- **Bone density:** Patient bone density testing baseline and periodically, bone loss may occur with long-term therapy
- **Pregnancy/breastfeeding:** May be used in pregnancy, breastfeeding

### Patient/family education
- Teach patient that product is not a cure but controls symptoms and that treatment is long term
- Instruct patient to report excitability, irritability, anxiety, sweating, heat intolerance, chest pain, palpitations, which indicate overdose
- Advise patient not to switch brands unless approved by prescriber; bioavailability may differ; do not take with food; absorption will be decreased
- Teach patient that product may be discontinued after giving birth; thyroid panel will be evaluated after 1-2 mo
- Teach patient or parent that hyperthyroid child will show almost immediate behavior/personality change; that hair loss will occur in child but is temporary
- Caution patient that product is not to be taken to reduce weight
- Caution patient to avoid OTC preparations with iodine; read labels; other medications should not be used unless approved by prescriber, not to switch brands, protect from light, moisture
- Teach patient to avoid iodine-rich food: iodized salt, soybeans, tofu, turnips, high-iodine seafood, some bread, products
- **Pregnancy/breastfeeding**: Teach patient to continue using in pregnancy, breastfeeding

### Evaluation
**Positive therapeutic outcome**
- Absence of depression
- Weight loss, increased diuresis, pulse, appetite
- Absence of constipation, peripheral edema, cold intolerance, pale, cool dry skin, brittle nails, alopecia, coarse hair, menorrhagia, night blindness, paresthesias, syncope, stupor, coma, rosy cheeks
- Improved levels of $T_3$, $T_4$ by laboratory tests
- Child: age-appropriate weight, height, and psychomotor development

## TREATMENT OF OVERDOSE:
Withhold dose for up to 1 wk; acute overdose: gastric lavage or induced emesis, provide supportive treatment to control symptoms

**⚠ HIGH ALERT**

## lidocaine, parenteral (Rx)
(lye'doe-kane)
**LidoPen Auto-Injector, Xylocaine, Xylocard**
*Func. class.:* Antidysrhythmic (class IB)
*Chem. class.:* Aminoacyl amide

**ACTION:** Increases electrical stimulation threshold of ventricle and His-Purkinje system, which stabilizes cardiac membrane and decreases automaticity

**Therapeutic outcome:** Decreased ventricular dysrhythmia

## USES:
Ventricular tachycardia, ventricular dysrhythmias during cardiac surgery, MI, digoxin toxicity, cardiac catheterization

## CONTRAINDICATIONS
Hypersensitivity to amides, severe heart block, supraventricular dysrhythmias, Adams-Stokes syndrome, Wolff-Parkinson-White syndrome

**Precautions:** Pregnancy, breastfeeding, children, geriatric, renal/hepatic disease, HF, respiratory depression, malignant hyperthermia, myasthenia gravis, weight <50 kg

## DOSAGE AND ROUTES
### Ventricular arrythmias caused by MI, cardiac manipulation, glycosides
**Adult:** **IV** BOL 50-100 mg (1-1.5 mg/kg) 25-50 mg/min, repeat 5min, until arrythmias are controlled, max 300 mg in 1 hr; begin **IV** INF 1-4 mg/min (20-50 mcg/kg/min)
**Child:** IV/intraosseous bolus: 1 mg/kg, start infusion at 30 mcg/kg/min

**Available forms:** **IV inf** 0.2% (2 mg/ml), 0.4% (4 mg/ml), 0.8% (8 mg/ml); **IV** admixture 4% (40 mg/ml), 10% (100 mg/ml), 20% (200 mg/ml); **IV direct** 1% (10 mg/ml), 2% (20 mg/ml); inj (to IV admixture) 20% (200 mg/ml)

### Implementation
**IM route**
- Administer in deltoid, aspirate to prevent **IV** administration
- Check site daily for extravasation, do not use in shock

**Direct IV route**
- Give undiluted (1%, 2% only); give 6 mg or less over 1 min; if using an **IV** line, use port near insertion site, flush with 0.9% NaCl (50 ml)
- Store at room temperature; sol should be clear

**Continuous IV infusion route**
- Give after adding 1 g/250-1000 ml of $D_5W$; give 1-4 mg/min; use infusion pump for correct dosage; pediatric inf is 120 mg of lidocaine/100 ml of $D_5W$; 1-2.5 ml/kg/hr = 20-50 mcg/kg/min; use only 1%, 2% sol
- Use cardiac monitor
- Additive syringes/single-use vials are for infusing and must be diluted

**Solution compatibilities:** $D_5W$, $D_5$/0.9% NaCl, $D_5$/0.45% NaCl, $D_5$/LR, LR, 0.9% NaCl, 0.45% NaCl

**Y-site compatibilities:** Acetaminophen, alemtuzumab, alfentanil, alteplase, amikacin, aminocaproic acid, aminophylline, amiodarone, amphotericin B lipid/liposome, anidulafungin, argatroban, ascorbic acid injection, atenolol, atracurium, atropine, azithromycin, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, carmustine, ceFAZolin, cefotaxime, cefoTEtan, cefOXitin, ceftaroline, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clarithromycin, clindamycin, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, DAUNOrubicin, dexamethasone, dexmedetomidine, dexrazoxane, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doxacurium, DOXOrubicin, DOXOrubicin liposomal, doxycycline, enalaprilat, EPINEPHrine, epirubicin, epoetin alfa, eptifibatide, ertapenem, erythromycin, esmolol, etomidate, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, folic acid, furosemide, gentamicin, granisetron, haloperidol, heparin, hydrocortisone, imipenem/cilastatin, inamrinone, insulin, isoproterenol, ketorolac, labetalol, levofloxacin, linezolid, LORazepam, magnesium sulfate, meperidine, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, micafungin, midazolam, morphine, nafcillin, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, ondansetron, palonosetron, penicillin G potassium, phenylephrine, phytonadione, piperacillin/tazobactam, potassium chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, quinupristin/dalfopristin, ranitidine, remifentanil, sodium bicarbonate, tacrolimus, theophylline, ticarcillin/clavulanate, tigecycline, tirofiban, tobramycin, vancomycin, vasopressin, verapamil, vitamin B complex with C, voriconazole, warfarin

**Y-site incompatibilities:** Acyclovir, amphotericin B cholesteryl sulfate complex/colloidal, azaTHIOprine, caspofungin, diazepam, ganciclovir, lansoprazole, pantoprazole, phenytoin, thiopental, trimethoprim/sulfamethoxazole

## ADVERSE EFFECTS
**CNS:** *Headache, dizziness,* involuntary movement, confusion, tremor, *drowsiness,* euphoria, seizures, shivering

**CV:** *Hypotension, bradycardia,* heart block, cardiovascular collapse, arrest
**EENT:** Tinnitus, blurred vision
**GI:** Nausea, vomiting, anorexia
**HEMA:** Methemoglobinemia
**INTEG:** Rash, urticaria, edema, swelling, petechiae, pruritus
**MISC:** Febrile response, phlebitis at inj site
**RESP:** Dyspnea, respiratory depression

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete bioavailability (**IV**) |
| **Distribution** | Erythrocytes, cardiovascular endothelium |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | Biphasic 8 min, 1-2 hr |

### Pharmacodynamics

| | IV | IM |
|---|---|---|
| **Onset** | 2 min | 5-15 min |
| **Peak** | Unknown | ½ hr |
| **Duration** | 20 min | 1½ hr |

## INTERACTIONS

### Individual drugs

Amiodarone, phenytoin, procainamide, propranolol, quiNIDine: increase cardiac depression, toxicity
Cimetidine, metoprolol, phenytoin: increased lidocaine effects
CycloSPORINE: decreased effect of cycloSPORINE

### Drug classifications

Antihypertensives, MAOIs: increased hypotensive effects
β-blockers, protease inhibitors: increased lidocaine effects, toxicity
Barbiturates: decreased lidocaine effects
Ergots: Increased hypotension, avoid concurrent use
Neuromuscular blockers: increased neuromuscular blockade, monitor for effects

## NURSING CONSIDERATIONS

### Assessment

- Assess for oxygenation or perfusion deficit: decreased B/P, chest pain, dizziness, loss of consciousness
- Assess respiratory status: auscultate lung fields for bibasilar crackles in patients with advanced HF
- Assess for urinary retention: check for pain, abdominal absorption, palpate bladder; check males with benign prostatic hypertrophy; anticholinergic reaction may cause retention
- Monitor I&O ratio, electrolytes (potassium, sodium, chloride); watch for decreasing urinary output, possible retention
- Monitor liver function tests: AST, ALT, bilirubin, alk phos
- Monitor ECG continuously to determine product effectiveness, measure PR, QRS, QT intervals, check for PVCs, other dysrhythmias; monitor B/P continuously for hypo/hypertension; check for rebound hypertension after 1-2 hr, prolonged PR/QT intervals, QRS complex; if QT or QRS increases by 50% or more, withhold next dose, notify prescriber
- Monitor for CNS symptoms: confusion, numbness, depression, involuntary movements; if these occur, product should be discontinued
- Monitor drug levels (therapeutic level 1.5-5 mcg/ml), notify prescriber of abnormal results
- **Malignant hyperthermia:** Monitor for tachypnea, tachycardia, changes in B/P, increased temperature
- **Toxicity:** Monitor for seizures, confusion, tremors, if these occur discontinue immediately, notify prescriber, keep emergency equipment nearby
- **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding, excreted in breast milk

### Patient/family education

- Teach patient or family reason for use of medication and expected results
- Instruct patient in at-home use of Lidopen Auto-Injector; patient should call prescriber before use if heart attack is imminent

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P, dysrhythmias
- Decreased heart rate
- Normal sinus rhythm

## TREATMENT OF OVERDOSE:

Oxygen, artificial ventilation, ECG, administer DOPamine for circulatory depression, diazepam or thiopental for seizures; decreased product or discontinuation may be required

**lidocaine topical**
*See Appendix B*

**⚠ HIGH ALERT**

# linagliptin

(lin-a-glip'tin)

**Tradjenta, Trajenta** 🍁

*Func. class.:* Antidiabetic

*Chem. class.:* Dipeptidyl peptidase-4 inhibitor

**ACTION:** Slows the inactivation of incretin hormones. Concentrations of the active, intact hormones are increased by linagliptin, thereby increasing and prolonging the action of these hormones. Incretin hormones are released by the intestine throughout the day, and levels are increased in response to a meal.

**Therapeutic outcome:** Decreasing blood glucose level, A1C; decreasing polydipsia, polyphagia

**USES:** Type 2 diabetes mellitus

## CONTRAINDICATIONS

Hypersensitivity to linagliptin, type 1 diabetes mellitus, diabetic ketoacidosis (DKA)

**Precautions:** Pregnancy, breast-feeding, adolescents or children <18 years old, debilitated physical condition, malnutrition, uncontrolled adrenal insufficiency, pituitary insufficiency, hypothyroidism, diarrhea, gastroparesis, GI obstruction, ileus, female hormonal changes, high fever, severe psychological stress, uncontrolled hypercortisolism, hyperthyroidism

## DOSAGE AND ROUTES

**Adjunct to diet and exercise to improve glycemic control in adults with type 2 diabetes**

**Adult: PO** 5 mg/day; when used with a sulfonylurea, a lower dose of the sulfonylurea or insulin may be necessary to minimize the risk of hypoglycemia

**Available forms:** Tab 5 mg

### Implementation

- Given once daily; may give without regard to food
- May require an increased dose in stress, fever, surgery, trauma
- Store at room temperature

## ADVERSE EFFECTS

**CNS:** Headache
**EENT:** Nasopharyngitis
**ENDO:** Hyperuricemia, hypoglycemia
**GI:** Body weight loss, pancreatitis
**INTEG:** Serious angioedema, exfoliative dermatitis, hypersensitivity reactions, urticaria
**MISC:** Arthralgia, back pain
**RESP:** Bronchial hyperreactivity (with bronchospasm), cough, nasopharyngitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly, bioavailability 30% |
| **Distribution** | Extensive, tissues; protein binding concentration dependent |
| **Metabolism** | Weak CYP3A4 inhibitor |
| **Excretion** | 90% unchanged, 80% enterohepatic, urine 5% |
| **Half-life** | Terminal >100 hr, effective 12 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol, cisapride, lithium, metoclopramide, tegaserod: increased need for dosing change
Bumetanide, dextrothyroxine, ethacrynic acid, ethotoin, fosphenytoin, furosemide, glucagon, niacin (nicotinic acid), phenothiazine, phenytoin, torsemide, triamterene: decreased hypoglycemic effect
CloNIDine, dexfenfluramine, disopyramide, fenfluramine, FLUoxetine, guanethidine, octreotide: increased hypoglycemia
Reserpine, β-blockers: increased masking the signs and symptoms of hypoglycemia

### Drug classifications

Beta blockers, ACE inhibitors, angiotensin II receptor antagonists, fibric acid derivatives, monoamine oxidase inhibitors (MAOIs), salicylates, sulfonylureas: increased or prolonged hypoglycemia
Atypical antipsychotics (ARIPiprazole, cloZAPine, OLANZapine, QUEtiapine, risperiDONE, and ziprasidone), carbonic anhydrase inhibitors, estrogens, glucocorticoids, oral contraceptives, progestins, thiazide diuretics, thyroid hormones: decreased hypoglycemic effect
Androgens, quinolones: increased need for dosing change
CYP3A4 inducers (topiramate, rifabutin, pioglitazone, OXcarbazepine, carBAMazepine, nevirapine, modafinil, metyrapone, etravirine, efavirenz, bosentan, barbiturates, aprepitant, fosaprepitant): decreased effect of linagliptin

### Drug/lab test

Increased: uric acid
Decrease: HbA1C level, fasting blood glucose

## NURSING CONSIDERATIONS

### Assessment

- Monitor blood glucose, A1C, during treatment to determine diabetes control; monitor for hypoglycemia: confusion, sweating, tachycardia, anxiety; hyperglycemia, polydipsia, polyuria, polyphagia
- Monitor CBC baseline and periodically during treatment, report decreased blood counts
- **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding, excretion unknown

### Patient/family education

- Teach patient the symptoms of hypo/hyperglycemia and what to do about each; to have glucagon emergency kit available, carry sugar packets
- Advise patient that product must be continued on a daily basis, explain consequences of discontinuing product abruptly; to take only as directed
- Direct patient to avoid OTC products unless approved by prescriber
- Teach patient that diabetes is a life-long illness, product will not cure diabetes
- Advise patient to carry emergency ID with prescriber, condition and medications taken
- Report immediately, skin disorders, swelling, difficulty breathing, or severe abdominal pain
- **Pancreatitis (rare):** Teach patient to report immediately severe abdominal pain, vomiting may be fatal, discontinue product immediately, use supportive therapy, monitor amylase, lipase electrolytes
- **Arthralgia:** May be severe, but temporary
- **Pregnancy:** Teach patient to notify provider if pregnancy is planned or suspected, or if breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Improving blood glucose level, A1C; decreasing polydipsia, polyphagia, polyuria, clear sensorium, absence of dizziness

## lindane (OTC)

(lin-dane)

**Hexit, GBH, Kwedella**

*Func. class.:* Scabicide/pediculicide

*Chem. class.:* Chlorinated hydrocarbon (synthetic)

**ACTION:** Stimulates nervous system of arthropods, resulting in seizures, death of organism

**Therapeutic outcome:** Resolution of infestation

**USES:** Scabies, lice (head/pubic/body), nits in those intolerant to or who do not respond to other agents

## CONTRAINDICATIONS

Hypersensitivity; patients with known seizure disorders; Norwegian (crusted) scabies

**BLACK BOX WARNING:** Premature neonate; inflammation of skin, abrasions, or breaks in skin; seizure disorder

**Precautions:** Pregnancy, breastfeeding, infants, children <10 yr; avoid contact with eyes

## DOSAGE AND ROUTES

### Lice

**Adult and child:** Shampoo using 30 ml, work into lather, rub for 5 min, rinse, dry with towel; use fine-toothed comb to remove nits; most require 1 oz, max 2 oz

### Scabies

**Adult and child:** TOP cream/lotion wash area with soap and water, remove visible crusts; apply to skin surfaces; remove with soap, water 8-12 hr after application; may reapply in 1 wk if needed; TOP apply 1% cream/lotion to skin from neck to bottom of feet, toes; repeat in 1 wk if necessary; most require 1 oz, max 2 oz

**Available forms:** Lotion, shampoo, cream (1%)

### Implementation

- Apply to body areas, scalp only; do not apply to face, lips, mouth, eyes, any mucous membrane, anus, or meatus
- Give topical corticosteroids as ordered to decrease contact dermatitis; provide antihistamines
- Apply menthol or phenol lotions to control itching
- Give topical antibiotics for infection
- Provide isolation until areas on skin, scalp have cleared and treatment is completed
- Remove nits by using a fine-toothed comb rinsed in vinegar after treatment; use gloves
- Caregivers applying these products to another person should wear gloves less permeable to lindane, thoroughly clean hands after application, avoid natural latex gloves

**Cream/ointment/lotion**

- Use for scabies only; skin should be clean without other products on it, wait 1 hr after bathing or showering before application, shake well, apply under fingernails after trimming, a toothbrush can be used to apply; after application wrap toothbrush in paper and discard, use only a single application, apply as a thin layer over all

skin from neck down, close bottle with leftover and discard
• Do not cover, wash off after 8-12 hr using warm (not hot) water, do not leave on >12 hr
**Shampoo**
• For lice only, do not use other hair products before use, shake well, hair should be completely dry, use only enough shampoo to lightly wet the hair and scalp, work into hair, do not use water, allow to remain only 4 min, rinse and lather away, towel briskly

## ADVERSE EFFECTS
**CNS:** Seizures, stimulation, dizziness
**INTEG:** *Pruritus, rash, irritation, contact dermatitis*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 20% |
| **Distribution** | Fat |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | 18 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 3 hr |
| **Peak** | Rapid |
| **Duration** | 3 hr |

## INTERACTIONS
Oil-based hair dressing: increased absorption; wash, rinse, and dry hair before using lindane

## NURSING CONSIDERATIONS
### Assessment
**BLACK BOX WARNING:** Skin with abrasions, breaks, inflammation; do not use on these areas

• **Infestation:** Assess head, hair for lice and nits before, after treatment; if scabies are present, check all skin surfaces
• Identify source of infection: school, family members, sexual contacts
• **Pregnancy/breastfeeding:** Avoid in pregnancy, breastfeeding

### Patient/family education
• Advise patient to wash all inhabitants' clothing, using insecticide; preventive treatment may be required for all persons living in same house, using lotion or shampoo to decrease spread of infection; use rubber gloves when applying product
• Instruct patient that itching may continue for 4-6 wk; that product must be reapplied if accidentally washed off, or treatment will be ineffective; remove after specified time to prevent toxicity
• Advise patient not to apply to face; if contact with eyes occurs, flush with water
• Advise patient that sexual contacts should be treated simultaneously
• **Inform the patient of CNS toxicity:** dizziness, cramps, anxiety, nausea, vomiting, seizures

### Evaluation
**Positive therapeutic outcome**
• Decreased crusts, nits, brownish trails on skin, itching papules in skinfolds
• Decreased itching after several wk

## TREATMENT OF INGESTION:
Gastric lavage, saline laxatives, **IV** diazepam (Valium) for seizures (if taken orally)

## linezolid (Rx)
(lih-nee'zoh-lid)
**Zyvox**
*Func. class.:* Broad-spectrum antiinfective
*Chem. class.:* Oxazolidinone

L

**Do not confuse:** Zyvox/Vioxx/Zovirax

## ACTION:
Inhibits protein synthesis by interfering with translation; binds to bacterial 23S ribosomal RNA of the 50S subunit, preventing formation of the bacterial translation process in primarily gram-positive organisms

**Therapeutic outcome:** Negative blood cultures, absence of signs/symptoms of infection

## USES:
Vancomycin-resistant *Enterococcus faecium* infections, nosocomial pneumonia caused by *Staphylococcus aureus* or *Streptococcus pneumoniae,* uncomplicated or complicated skin and skin structure infections, community-acquired pneumonia, *Pasteurella multocida,* viridans Streptococcus, *E. faecium* infections *S. aureus, S. pyogenes;* can be used for MSSA/MSRA/MDRSP/ strains

## CONTRAINDICATIONS
Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, thrombocytopenia, bone marrow suppression, hypertension, hyperthyroidism, pheochromocytoma, seizure disorder, ulcerative colitis, MI, PKU, renal/GI disease

## DOSAGE AND ROUTES
**Vancomycin-resistant *E. faecium* infections, including concurrent bacteremia**
**Adult/adolescent/child ≥12 yr: IV**/PO 600 mg q12hr × 14-28 days; max 1200 mg/day

**Child <12 yr/infant/term neonate:** **IV**/PO 10 mg/kg q8hr × 14-28 days

### Hospital-acquired pneumonia/ complicated skin infections/ community-acquired pneumonia/ concurrent bacterial infection

**Adult /child ≥ 12 yr:** **IV**/PO 600 mg q12hr × 10-14 days; max 1200 mg/day
**Child birth-11 yr:** PO 10 mg/kg q8hr × 10-14 days

### Uncomplicated skin infections caused by *S. aureus* (MSSA only) or *S. pyogenes*

**Adult:** **IV**/PO 400 mg q12hr × 10-14 days; max 1200 mg/day
**Adolescent:** PO 600 mg q12hr × 10-14 days, max 1200 mg/day
**Child 5-11 yr:** PO 10 mg/kg q12hr × 10-14 days
**Neonate ≥ 7 days old/infant/child <5 yr old:** PO 10 mg/kg q8hr × 10-14 days
**Infant, preterm <7 days old:** PO 10 mg/kg q12hr × 10-14 days

**Available forms:** Tabs 600 mg; oral susp 100 mg/5 ml; inj 2 mg/ml

### Implementation

**PO route**

- Store reconstituted oral susp at room temperature, use within 3 wk
- Give over 30-120 min; do not use **IV** inf bag in series connections, do not use with additives in sol, do not use with another product, administer separately, flush line before and after use

**Intermittent IV infusion route**

- Do not use if particulate is present; yellow color is normal
- Premixed solutions are ready to use (2 mg/ml)
- Store at room temperature in original packaging

**Y-site compatibilities:** Acyclovir, alfentanil, amikacin, aminophylline, ampicillin, aztreonam, bretylium, buprenorphine, butorphanol, calcium gluconate, CARBOplatin, ceFAZolin, cefoperazone, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, cyclophosphamide, cycloSPORINE, cytarabine, HYDROmorphone, ifosfamide, labetalol, leucovorin, levofloxacin, lidocaine, LORazepam, magnesium sulfate, mannitol, meperidine, meropenem, mesna, methotrexate, methylPREDNISolone, metoclopramide, metroNIDAZOLE, midazolam, minocycline, mitoXANtrone, morphine, nalbuphine, naloxone, nitroglycerin, ofloxacin, ondansetron, PACLitaxel, PENTobarbital, piperacillin, potassium chloride, prochlorperazine, promethazine, propranolol, ranitidine, remifentanil, theophylline, ticarcillin, tobramycin, vancomycin, vecuronium, verapamil, vinCRIStine, zidovudine

**Solution compatibilities:** $D_5W$, 0.9% NaCl, LR

## ADVERSE EFFECTS

**CNS:** *Headache,* dizziness, insomnia
**GI:** *Nausea, diarrhea,* increased ALT, AST, *vomiting,* taste change, tongue color change, pseudomembranous colitis
**HEMA:** Myelosuppression
**MISC:** Vaginal moniliasis, fungal infection, oral moniliasis, lactic acidosis, anaphylaxis, angioedema, Stevens-Johnson syndrome, serotonin syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid, excessive |
| **Distribution** | Protein binding 31% |
| **Metabolism** | Oxidation of the morpholine ring |
| **Excretion** | Unknown |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Amoxapine, cyclobenzaprine, maprotiline, methyldopa, mirtazapine, traZODone: increased hypertensive crisis, seizures, coma

### Drug classifications

Adrenergic blockers (dopamine, EPINEPHrine, pseudoePHEDrine): increased effects of adrenergics, monitor B/P
Antidepressants (tricyclics): increased hypertensive crisis, seizures, coma
MAOIs or those that possess MAOI-like action (furazolidone, isoniazid, procarbazine): do not use together; hypertensive crisis may occur
SSRIs, SNRIs: increased serotonin syndrome, notify prescriber immediately
Serotoninergic agents: increased effect

### Drug/herb

Green tea, valerian, ginseng, yohimbe, kava: avoid use

### Drug/lab test
Increase: LFTs, alkaline phosphatase, amylase, lipase, BUN
Decrease: WBC, platelets, blood glucose

### Drug/food
Tyramine foods: avoid; increased pressor response

## NURSING CONSIDERATIONS
### Assessment
- Assess CNS symptoms: headache, dizziness
- Monitor liver function tests: AST, ALT
- Monitor CBC weekly, assess for myelosuppression (anemia, leukopenia, pancytopenia, thrombocytopenia)
- **Pseudomembranous colitis:** Assess for diarrhea, abdominal pain, fever, fatigue, anorexia; possible anemia, elevated WBC, and low serum albumin; stop product and usually give either vancomycin or IV metroNIDAZOLE
- **Serotonin syndrome:** at least 2 wk should elapse between continuing linezolid and start of serotonergic agents; assess for increased heart rate, shivering, sweating, dilated pupils, tremor, high B/P, hyperthermia, headache, confusion; if these occur stop linezolid; administer a serotonin antagonist if needed
- **Lactic acidosis:** repeated nausea/vomiting, unexplained acidosis, low bicarbonate level: notify prescriber immediately
- **Anaphylaxis/angioedema/Stevens-Johnson syndrome:** rash, pruritus, difficulty breathing, fever: have emergency equipment nearby
- **Diabetes mellitus:** Monitor those receiving insulin or oral antidiabetics for increased hypoglycemia
- **Pregnancy/breastfeeding:** Avoid in pregnancy, breastfeeding

### Patient/family education
- Advise patient if dizziness occurs, to ambulate and perform activities with assistance
- Advise patient to complete full course of product therapy
- Advise patient to contact prescriber if adverse reaction occurs
- Advise patient to avoid large amounts of tyramine-containing foods (give list)
- **Serotonin syndrome:** Notify provider immediately of fever, sweating, diarrhea, confusion
- Teach patient that tab and suspension may be taken with or without food

### Evaluation
**Positive therapeutic outcome**
- Decreased symptoms of infection, blood cultures negative

**⚠ HIGH ALERT**

## liraglutide (Rx)
(lir'a-gloo'tide)
**Saxenda, Victoza**
*Func. class.:* Antidiabetic agent
*Chem. class.:* Incretin mimetics

**ACTION:** Improved glycemic control and potential weight loss via activation of the glucagon-like peptide-1 (GLP-1) receptor

**Therapeutic outcome:** Stable and improved serum glucose, HbA1C, weight loss

**USES:** Type 2 diabetes mellitus in combination with diet and exercise, obesity

## CONTRAINDICATIONS
Hypersensitivity, pancreatitis, pregnancy

**Precautions:** Alcoholism, breastfeeding, children, cholelithiasis, ketoacidosis, diarrhea, elderly, fever, gastroparesis, hepatic disease, hypoglycemia, infection, renal disease, surgery, thyroid disease, trauma, vomiting, medullary thyroid carcinoma (MTC), multiple endocrine neoplasia syndrome type 2 (MEN 2), thyroid cancer

**BLACK BOX WARNING:** Thyroid C-cell tumors

## DOSAGE AND ROUTES
**Adult:** SUBCUT 0.6 mg/day × 1 wk, then increase to 1.2 mg/day, max 1.8 mg/day

**Available forms:** Solution for injection 0.6, 1.2, 1.8, 2, 4, 3 mg prefilled pen

### Implementation
**SUBCUT route**
- Use safe handling procedures
- Give by SUBCUT only, inspect for particulate matter or discoloration, do not use if unusually viscous, cloudy, discolored, or if particles are present; give daily at any time without regard to meals; pen needles must be purchased separately, use Novo Nordisk needles, prime before first use, see manual for directions; give in thigh, abdomen, or upper arm; lightly pinch fold of skin, insert needle at 90-degree angle or 45-degree angle if thin, release skin, aspiration is not needed, give over 6 seconds, rotate injection sites

• Storage: do not store pen with needle attached; avoid direct heat and sunlight, discard 30 days after first use, after first use may be stored at room temperature or refrigerated, do not freeze; if >3 days have elapsed since last dose, reinitiate at 0.6 mg, titrate
• If dose is missed, resume once daily dosing at next scheduled dose

## ADVERSE EFFECTS

**CNS:** Dizziness, headache
**CV:** Hypertension
**ENDO:** Hypoglycemia
**EENT:** Sinusitis
**GI:** Abdominal pain, anorexia, constipation, diarrhea, dyspepsia, nausea, vomiting, pancreatitis
**INTEG:** Angioedema, erythema, injection site reaction, urticaria
**MS:** Back pain
**SYST:** Antibody formation, infection, influenza, secondary thyroid malignancy, anaphylaxis, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Protein binding (98%) |
| **Distribution** | Binds to albumin, then released into circulation |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 12-13 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Peak 8-12 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Atorvastatin, acetaminophen, griseofulvin: increased or decreased effects of each specific drug
Baclofen, cycloSPORINE, tacrolimus, dextrothyroxine, diazoxide, phenytoin, fosphenytoin, ethotoin, isoniazid, niacin, nicotine: increased hyperglycemic reactions
Bortezomib, cloNIDine, alcohol, lithium, pentamidine: increased or decreased hypoglycemic reactions
Dexfenfluramine, fenfluramine, disopyramide, FLUoxetine, mecasermin, octreotide, pegvisomant, salicylates: increased hypoglycemic reactions
Digoxin: decreased digoxin levels

### Drug classifications

Angiotensin II receptor antagonists, ACE inhibitors, other antidiabetics, β-blockers, fibric acid derivatives, MAOIs, salicylates: increased hypoglycemic reactions
Protease inhibitors, phenothiazines, atypical antipsychotics, corticosteroids, carbonic anhydrase inhibitors, estrogens, progestins, oral contraceptives, growth hormones, sympathomimetics: increased hyperglycemic reactions
Androgens, quinolones: decreased liraglutide effect

### Drug/lab test

Increase: Calcitonin, lipase
Decrease: Glucose

## NURSING CONSIDERATIONS

### Assessment

• Watch for hypoglycemic reactions that can occur soon after meals: hunger, sweating, weakness, dizziness, tremors, restlessness, tachycardia
• Assess for hypersensitivity to this product
• Monitor serum glucose, A1C, CBC during treatment
• **Assess for stress:** diabetic patients exposed to stress, surgery, fever, infections may require insulin administration temporarily
• **Assess for serious skin reactions:** angioedema; also pancreatitis, secondary thyroid malignancy
• **Pregnancy:** Identify if pregnancy is planned or suspected or if breastfeeding
• **Pancreatitis:** Monitor for nausea, vomiting, severe abdominal pain, product should be discontinued, give supportive care, monitor amylase, lipase, electrolytes

**BLACK BOX WARNING:** Thyroid C-cell tumors: monitor during treatment; if calcitonin is elevated or if nodules can be felt, a referral is needed, do not use in those with a family history of MTC and those with multiple endocrine neoplasia syndrome type 2

### Patient/family education

• Teach patient the symptoms of hypo/hyperglycemia and what to do about each, to have glucagon emergency kit available, carry a carbohydrate source at all times
• Teach patient about side effects associated with therapy such as nausea and vomiting; upward dose titration can be delayed or ignored depending on tolerance
• Teach patient that diabetes is a lifelong illness, product does not cure disease and must be continued on a daily basis
• Instruct patient to carry emergency ID with prescriber's phone number and medications taken
• Advise patient to continue with other recommendations: diet, exercise, hygiene

- Teach patient to test blood glucose using a blood glucose meter
- Advise patient to avoid other medications, herbs, supplements unless approved by prescriber
- Advise patient to report serious skin effects, abdominal pain with nausea/vomiting
- Provide patient with written instructions if self-administration is ordered, to discard pen after 30 days
- **Hypersensitivity:** Teach patient to report any allergic symptoms
- Teach patient not to share product with other, infections may occur
- Teach patient that secondary malignancy is possible, that routing monitoring may be needed, to report trouble breathing, continuous hoarseness, lump in neck to report immediately
- Discuss possibilities of secondary malignancy, routine monitoring may be needed
- **Pregnancy/breastfeeding:** Teach patient that product is not to be used in pregnancy or breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Stable and improved serum glucose, A1C, weight loss

## lisinopril (Rx)

(lyse-in′oh-pril)

**Zestril**

*Func. class.:* Antihypertensive, angiotensin converting enzyme (ACE) I inhibitor

*Chem. class.:* Enalaprilat lysine analog

**Do not confuse:** lisinopril/Risperdal/Lipitor, Zestril/Zetia/Zipexa

**ACTION:** Selectively suppresses renin-angiotensin-aldosterone system; inhibits ACE; prevents conversion of angiotensin I to angiotensin II

**Therapeutic outcome:** Decreased B/P in hypertension, decreased preload, afterload in HF

**USES:** Mild to moderate hypertension, adjunctive therapy of systolic HF, acute MI

**Unlabeled uses:** Diabetic nephropathy/retinopathy, proteinuria, post MI

## CONTRAINDICATIONS

Hypersensitivity, angioedema

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Pregnancy (1st trimester), breastfeeding, renal disease, hyperkalemia, renal artery stenosis, HF, aortic stenosis

## DOSAGE AND ROUTES

### Hypertension

**Adult:** PO initially 10 mg, 10-40 mg/day; may increase to 80 mg/day if required

**Child ≥6 yr:** PO 0.7 mg/kg/day, up to 5 mg/day; titrate q1-2wk up to 0.6 mg/kg/day or 40 mg/day

**Geriatric:** PO 2.5-5 mg/day, increase q7day

### Renal dose

**Adult:** PO CCr <30 ml/min reduce dose by 50%, initially 5 mg/day, max 40 mg/day; CCr <10 ml/min 2.5 mg/day, max 40 mg/day

### Adjunctive treatment in combination with diuretics and cardiac glycosides for heart failure

**Adult:** PO 5 mg/day, increase if needed to max 20 mg/day or 40 mg/day (Zestril): in hyponatremia <130 mEq/L or creatinine >3 mg/dl or CCr <30 ml/min use 2.5 mg/day initially

### Acute myocardial infarction

**Adults who are hemodynamically stable:** PO give 5 mg within 24 hr of onset of symptoms, then 5 mg after 24 hr, 10 mg after 48 hr, then 10 mg/day

**Available forms:** Tabs 2.5, 5, 10, 20, 30 40 mg

### Implementation

- Store in airtight container at 86° F (30° C) or less
- Severe hypotension may occur after 1st dose of this medication; may be prevented by reducing or discontinuing diuretic therapy 3 days before beginning lisinopril therapy
- Without regard to food

## ADVERSE EFFECTS

**CNS:** *Vertigo,* depression, stroke, insomnia, paresthesias, *headache,* fatigue, asthenia, *dizziness*

**CV:** Chest pain, *hypotension,* sinus tachycardia

**EENT:** Blurred vision, nasal congestion

**GI:** Nausea, vomiting, anorexia, constipation, flatulence, GI irritation, diarrhea, hepatic failure, hepatic necrosis, pancreatitis

**GU:** Proteinuria, renal insufficiency, sexual dysfunction, impotence

**HEMA:** Neutropenia, agranulocytosis

**INTEG:** Rash, pruritus

**MISC:** Muscle cramps, *hyperkalemia*

**RESP:** Dry cough, dyspnea

**SYST:** Angioedema, anaphylaxis, toxic epidermal necrolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Variable |
| **Distribution** | Unknown |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys, unchanged |
| **Half-life** | 12 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 1 hr |
| **Peak** | 6-8 hr |
| **Duration** | 24 hr |

## INTERACTIONS

### Individual drugs

Alcohol (large amounts), probenecid: increased hypotension
Allopurinol: increased hypersensitivity
Aspirin: decreased lisinopril effect
CycloSPORINE: increased hyperkalemia
Indomethacin: decreased antihypertensive effect
Lithium: increased levels of lithium, toxicity

### Drug classifications

Antihypertensives, diuretics, nitrates, phenothiazines: increased hypotension
Diuretics, potassium-sparing, potassium salt substitutes, potassium supplements: increased hyperkalemia
NSAIDs: decreased lisinopril effect, adjust dose as needed

### Drug/food

High-potassium diet (bananas, orange juice, avocados, broccoli, nuts, spinach) should be avoided; hyperkalemia may occur, monitor potassium

### Drug/lab test

Interference: glucose/insulin tolerance tests, LFTs, BUN, creatinine

## NURSING CONSIDERATIONS

### Assessment

- **Assess blood studies:** platelets, WBC with differential: baseline, q3mo; if neutrophils are $<1000/mm^3$, discontinue treatment
- **Hypertension:** monitor B/P, check for orthostatic hypotension, syncope; if changes occur, dosage change may be required

**BLACK BOX WARNING:** Determine pregnancy before starting, if breastfeeding

- Establish baselines in renal/liver function tests before therapy begins
- **Acute MI:** Can be used in combination with salicylates, beta blockers, thrombolytics
- Monitor renal/liver function tests: protein, BUN, creatinine; watch for increased levels that may indicate nephrotic syndrome and renal failure; monitor renal symptoms: polyuria, oliguria, frequency, dysuria
- Check potassium levels throughout treatment, although hyperkalemia rarely occurs
- **HF:** check for edema in feet, legs daily, weight daily, dyspnea, wet crackles
- Assess for anaphylaxis, toxic epidermal necrolysis, angioedema, allergic reactions: rash, fever, pruritus, urticaria; facial swelling, dyspnea, tongue swelling (rare), have emergency equipment nearby, may be more common in Black patients; product should be discontinued if antihistamines fail to help

**BLACK BOX WARNING:** Pregnancy/breastfeeding: Do not use in pregnancy, breastfeeding

### Patient/family education

- Caution patient not to discontinue product abruptly; advise patient to inform all health care providers about taking this product
- Teach patient not to use OTC products (cough, cold, allergy) unless directed by prescriber; serious side effects can occur
- Teach patient the importance of complying with dosage schedule, even if feeling better; to continue with medical regimen to decrease B/P: exercise, cessation of smoking, decreasing stress, diet modifications
- Teach patient to notify prescriber of mouth sores, sore throat, fever, swelling of hands or feet, irregular heartbeat, chest pain, coughing, shortness of breath
- Caution patient to report excessive perspiration, dehydration, vomiting, diarrhea; may lead to fall in B/P
- Emphasize the need to rise slowly to sitting or standing position to minimize orthostatic hypotension; not to exercise in hot weather or increased hypotension can occur
- Caution patient that product may cause dizziness, fainting, light-headedness; may occur during 1st few days of therapy; to avoid activities that may be hazardous
- Teach patient how to take B/P, and normal readings for age-group; advise patient to take B/P regularly
- Instruct patient to avoid increasing potassium in the diet

**BLACK BOX WARNING:** Advise patient to report if pregnancy is planned or suspected, do not breastfeed, not to use in pregnancy

### Evaluation
**Positive therapeutic outcome**
- Decreased B/P in hypertension
- Decreased HF symptoms

## TREATMENT OF OVERDOSE:
0.9% NaCl **IV** inf, hemodialysis

## lithium (Rx)
(li'thee-um)
**Carbolith, Lithane, Lithobid**
*Func. class.:* Antimanic, antipsychotic
*Chem. class.:* Alkali metal ion salt

**Do not confuse:** lithium/lanthanum

**ACTION:** May alter sodium, potassium ion transport across cell membrane in nerve, muscle cells; may balance biogenic amines of norepinephrine, serotonin in CNS areas involved in emotional responses

**Therapeutic outcome:** Stable mood

**USES:** Bipolar disorder (manic phase), prevention of bipolar manic-depressive psychosis

## CONTRAINDICATIONS
Pregnancy, breastfeeding, children <12 yr, hepatic disease, brain trauma, organic brain syndrome, schizophrenia, severe cardiac/renal disease, severe dehydration

**Precautions:** Geriatric, thyroid disease, seizure disorders, diabetes mellitus, systemic infection, urinary retention, QT prolongation

**BLACK BOX WARNING:** Lithium level >1.5 mmol/L

## DOSAGE AND ROUTES NTI
### Bipolar disorder (mania)
**Adult:** PO 600 mg tid; maintenance 300 mg tid or qid; EXT REL 900 mg q12hr; dosage should be individualized to maintain blood levels at 0.5-1.5 mEq/L or 0.6-1.2 mEq/L (maintenance)
**Geriatric:** PO 300 mg bid, increase q7day by 300 mg to desired dose
**Child:** PO 15-20 mg/kg/day in 3-4 divided doses; increase as needed; do not exceed adult doses; maintain blood levels at 0.4-0.5 mEq/L

### Renal dose
**Adult:** PO CCr 10-50 ml/min 50%-75% of dose; CCr <10 ml/min 25%-50% of dose

**Available forms:** Caps 150, 300, 600 mg; tabs 300 mg; ext rel tabs 300, 450 mg; syr 300 mg/5 ml (8 mEq/5 ml)

### Implementation
- Do not break, crush, or chew caps and slow rel caps
- Administer reduced dosage to geriatric; give with meals to avoid GI upset
- Provide adequate fluids (2-3 L/day) to prevent dehydration during initial treatment, 1-2 L/day during maintenance
- Give list of products that interact with lithium

## ADVERSE EFFECTS
**CNS:** *Headache, drowsiness, dizziness, tremors,* twitching, ataxia, seizures, slurred speech, restlessness, *confusion,* stupor, memory loss, clonic movements, *fatigue*
**CV:** *Hypotension,* ECG changes, dysrhythmias, circulatory collapse, edema, Brugada syndrome, QT prolongation
**EENT:** Tinnitus, blurred vision
**ENDO:** Hypothyroidism, goiter, hyperglycemia, hyperthyroidism, hyponatremia
**GI:** *Dry mouth, anorexia, nausea, vomiting, diarrhea,* incontinence, abdominal pain, metallic taste
**GU:** Polyuria, glycosuria, proteinuria, albuminuria, urinary incontinence, polydipsia
**HEMA:** Leukocytosis
**INTEG:** Drying of hair, alopecia, rash, pruritus, hyperkeratosis, *acneiform rash, folliculitis*
**MS:** *Muscle weakness*

### Pharmacokinetics
| | |
|---|---|
| **Absorption** | Completely absorbed |
| **Distribution** | Reabsorbed by renal tubules (80%); crosses blood-brain barrier; crosses placenta |
| **Metabolism** | Unknown |
| **Excretion** | Urine, unchanged |
| **Half-life** | 18-36 hr depending on age |

### Pharmacodynamics
| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | ½-3 hr |
| **Duration** | Unknown |

## INTERACTIONS
### Individual drugs
AcetaZOLAMIDE, aminophylline, mannitol, sodium bicarbonate: increased renal clearance
Calcium iodide, iodinated glycerol, potassium iodide: increased hypothyroid effect
CarBAMazepine, FLUoxetine, methyldopa, probenecid: increased lithium effect/toxicity
Haloperidol: increased neurotoxicity
Indomethacin, losartan: increased toxicity
Thioridazine: brain damage
Urea: decreased lithium effect

### Drug classifications

ACE inhibitors: Increase: Lithium level
Antiarrhythmics, other products that prolong the QT interval: Increase GT interval
Antithyroid agents: increased hypothyroid effects
β-Blockers used for lithium tremor: increase masking of lithium toxicity
Neuromuscular blocking agents: increased effect of neuromuscular blocking effects
NSAIDs, thiazides: increased lithium toxicity
Phenothiazines: increased effect of phenothiazines
Calcium channel blockers Theophyllines, urinary alkalinizers: decreased effect of lithium

### Drug/herb

Guarana, tea (black/green): decreased lithium effect
• Avoid use with kava, St. John's wort, valerian

### Drug/food

Caffeine: Decrease lithium level, adjust dose
Significant changes in sodium intake will alter lithium excretion

### Drug/lab test

Increased: potassium excretion, urine glucose, blood glucose, protein, BUN
Decreased: VMA, $T_3$, $T_4$, PBI, $^{131}I$

## NURSING CONSIDERATIONS

### Assessment

• **Bipolar disorder:** manic symptoms, mood, behavior before and during treatment

**BLACK BOX WARNING:** Assess for lithium toxicity: Vomiting, diarrhea, poor coordination, fine motor tremors, weakness, lassitude; major toxicity: coarse tremors, severe thirst, tinnitus, dilute urine. Monitor serum lithium levels weekly initially, then q2mo (therapeutic level: 0.5-1.5 mEq/L); toxic level >1.5 mcg/L; twitching; toxicity and therapeutic levels are very close; toxicity may occur rapidly; blood levels are measured before the AM dose, there is a narrow therapeutic index (NTI)

• Assess weight daily; check for edema in legs, ankles, wrists; report if present; check skin turgor at least daily
• Monitor sodium intake; decreased sodium intake with decreased fluid intake may lead to lithium retention; increased sodium and fluids may decrease lithium retention
• Monitor urine for albuminuria, glycosuria, uric acid during beginning treatment, q2mo thereafter, specific gravity any level <1.005 may indicate diabetes insipidus and should be reported to the provider
• Assess neurologic status: LOC, gait, motor reflexes, hand tremors
• ECG in those >50 yr with CV disease; cardiology consult is recommended in those with risk factors, QT prolongation may occur

### Patient/family education

• **Provide patient with written information on symptoms of minor toxicity:** vomiting, diarrhea, poor coordination, fine motor tremors, weakness, lassitude; major toxicity: coarse tremors, severe thirst, tinnitus, dilute urine, seek medical care immediately
• Advise patient to monitor urine specific gravity; emphasize need for follow-up care to determine lithium effects
• Advise patient that contraception is necessary, since lithium may harm fetus
• Caution patient not to operate machinery until lithium levels are stable and response determined; that beneficial effects may take 1-3 wk
• Provide to the patient a list of products that interact with lithium and discuss need for adequate, stable intake of salt and fluid
• Advise patient to have lithium levels monitored to ensure effectiveness
• Teach patient to use an emergency ID with diagnosis, product used

### Evaluation

**Positive therapeutic outcome**

• Decrease in excitement, poor judgment, insomnia (manic phase)
• Decreased mood swings and lability

## TREATMENT OF OVERDOSE:

Induce emesis or lavage, maintain airway, respiratory function; dialysis for severe intoxication

**⚠ HIGH ALERT**

# lixisenatide

(lixi-sena-tide)

**Adlyxin**

*Func. class.:* Antidiabetic
*Chem. class.:* Incretin mimetic

**ACTION:** An incretin mimetic; a glucagon-like peptide-1 (GLP-1) receptor agonist; binds and activates the GLP-1 receptor. GLP-1 is an important, gut-derived, glucose homeostasis regulator that is released after the oral ingestion of carbohydrates or fats. In patients with type 2 diabetes, GLP-1 concentrations are decreased in response to an oral glucose load. GLP-1 enhances insulin secretion; increases glucose-dependent insulin synthesis and secretion of insulin

from pancreatic beta cells in the presence of elevated glucose

**Therapeutic outcome:** Decreasing polydipsia, polyuria, polyphagia, clear sensorium, improving A1c, weight

**USES:** Treatment of type 2 diabetes mellitus in combination with diet and exercise

## CONTRAINDICATIONS

Angioedema

**Precautions:** Alcoholism, breastfeeding, children, cholelithiasis, diabetic ketoacidosis, gastroparesis, hypoglycemia, pancreatitis, pregnancy, renal failure, renal impairment, risk of serious hypersensitivity reactions or anaphylaxis, type 1 diabetes mellitus

## DOSAGE AND ROUTES

**Adult: SUBCUT** Initially, 10 mcg qday within 1 hr before the morning meal. If a dose is missed, give within 1 hr before the next meal. Continue 10 mcg qday <?> 14 days; on day 15, increase the dose to the maintenance dose of 20 mcg qday, max 20 mcg/day

### Renal dose

**Adult:** eGFR 30-89 ml/min/1.73 $m^2$ : No dosage adjustment needed; eGFR 15-29 ml/min/1.73 $m^2$ : Monitor closely for adverse reactions, especially hypoglycemia, nausea, and vomiting, and for changes in renal function. Dehydration and acute renal failure and worsening of chronic renal failure may occur in these patients; eGFR less than 15 ml/min/1.73 $m^2$ : Do not use

**Available forms:** Solution for injection 10 mcg, 20 mcg prefilled pen starter pack, maintenance pack

### Implementation

- May be used as monotherapy or with other antidiabetic medications. Dose adjustment of metformin or a thiazolidinedione is not usually required. A reduction in the dose of a sulfonylurea may be needed to reduce the risk of hypoglycemia
- Give subcut injection only. Do not give IV/IM
- Visually inspect for particulate matter and discoloration before use; do not use if unusually viscous, cloudy, discolored, or if particles are present
- Available as a prefilled pen. Each pen must be activated before the first use
- Administer qday within 1 hr before the first meal of the day, preferably the same meal each day. If a dose is missed, give within 1 hr before the next meal
- Inject subcut into the thigh, abdomen, or upper arm
- Double-check dosage before use
- Rotate sites with each injection to prevent lipodystrophy
- Storage: The pen should be protected from light and kept in its original packaging, discard pen 14 days after its first use

## ADVERSE EFFECTS

**CNS:** Dizziness, headache
**GI:** Nausea, vomiting, diarrhea, constipation, abdominal pain, dyspepsia, pancreatitis (rare)
**MISC:** Antibody formation, hypoglycemia, injection-site reactions, hypotension, anaphylactoid reaction, bronchospasm, renal failure, laryngeal edema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Eliminated through glomerular filtration and proteolytic degradation; elimination prolonged in renal disease with mild (CCr 60-89 ml/min), moderate (CCr 30-59 ml/min), and severe renal impairment (CCr 15-29 ml/min) was increased by approximately 34%, 69%, and 124%, respectively; use with caution in renal disease |
| **Half-life** | Terminal 1-3 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-3.5 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Androgens, carbonic anhydrase inhibitors, quinolones, salicylates: increased hypoglycemia or hyperglycemia

Antidiabetics: estrogens, MAOIs, NSAIDs, oral contraceptives, progestins, thiazide diuretics: decreased effect of each

Atypical antipsychotics, baclofen, corticosteroids, cyclosporine, niacin, phenothiazines, protease inhibitors, thyroid hormones, tacrolimus: increased hyperglycemia

Sulfonylureas: Increased: effect of ACE inhibitors, angiotensin II receptor antagonists, beta blockers, fibric acid derivatives: increased hypoglycemia

## NURSING CONSIDERATIONS

### Assessment

- Fasting blood glucose, A1c level during treatment to determine diabetic control
- **Pancreatitis:** Severe abdominal pain with or without nausea and vomiting, product should be discontinued immediately
- **Renal disease:** Monitor BUN, creatinine in mild renal disease, do not use in severe renal disease
- **Hypo-hyperglycemia:** reaction can occur soon after meals, for severe hypoglycemia give IV D50W, IV dextrose solution
- **Pregnancy:** If pregnant or planning to become pregnant, take oral contraceptive 1 hr before this product

### Patient/family education

- Not to share among patients. Even if the disposable needle is changed, sharing may result in transmission of hepatitis viruses, HIV, or other bloodborne pathogens. Do not share pens among multiple patients in an inpatient setting; use multidose vials, if available, or reserve the use of any pen to 1 patient only
- For patients and caregivers, give instruction on the preparation and use of the pen, include a practice injection
- About the signs and symptoms of hypohyperglycemia and what to do about each; to have emergency glucagon kit available at all times, to carry glucose source (sugar, candy)
- That product must be taken on a continuing basis, not to discontinue without prescriber's approval
- That diabetes is a lifelong condition, product will not cure condition, to carry emergency ID with condition, products taken, prescriber's phone number and name
- To continue weight control, dietary restrictions, exercise, hygiene
- That regular lab testing and A1c will be necessary
- **Pregnancy:** To notify prescriber if pregnant or planning to become pregnant, if taking oral contraceptives, take at least 1 hr before this product
- **Pancreatitis:** If severe abdominal pain occurs with or without nausea, vomiting, seek medical care immediately

### Evaluation

**Therapeutic response:** Decreasing polydipsia, polyuria, polyphagia, clear sensorium, improving A1c, weight

## Iodoxamide ophthalmic

*See Appendix B*

## Ioperamide (OTC, Rx)

(loe-per'a-mide)
**Diamode, Imodium, Imodium A-D,**
*Func. class.:* Antidiarrheal
*Chem. class.:* Piperidine derivative

**Do not confuse:** Imodium/Indocin, Loperamide/furosemide

**ACTION:** Direct action on intestinal muscles to decrease GI peristalsis; reduces volume, increases bulk; electrolytes are not lost

**Therapeutic outcome:** Absence of diarrhea

**USES:** Diarrhea (cause undetermined), chronic diarrhea, to decrease amount of ileostomy discharge, traveler's diarrhea

## CONTRAINDICATIONS

Hypersensitivity, pseudomembranous colitis, constipation, dysentery, GI bleeding/obstruction/perforation, ileus, vomiting

**Precautions:** Pregnancy, breastfeeding, children <2 yr, hepatic disease, gastroenteritis, toxic megacolon, geriatric patients, dehydration, bacterial disease, AIDS, severe ulcerative colitis

## DOSAGE AND ROUTES

**Adult:** PO 4 mg, then 2 mg after each loose stool, max 16 mg/24 hr
**Child 9-11 yr:** PO 2 mg, then 1 mg after each loose stool, max 6 mg/24 hr
**Child 6-8 yr:** PO 2 mg, then 0.1 mg/kg after each loose stool, max 4 mg/day
**Child 2-5 yr:** PO 1 mg, then 0.1 mg/kg after each loose stool, max 4 mg/24 hr

### Traveler's diarrhea (unlabeled)

**Adult:** PO 4 mg, then 2 mg after each diarrhea stool, max 16 mg/day

**Available forms:** Caps 2 mg; liquid 1 mg/5 ml; tabs 2 mg; chew tabs 2 mg

### Implementation

- Do not break, crush, or chew caps
- Store in airtight containers
- Do not mix oral sol with other sol

## ADVERSE EFFECTS

**CNS:** Dizziness, drowsiness, fatigue
**GI:** *Nausea, dry mouth, vomiting, constipation,* abdominal pain, anorexia, toxic megacolon, bacterial enterocolitis, flatulence
**INTEG:** Rash
**MISC:** Hyperglycemia
**SYST:** Anaphylaxis, angioedema, toxic epidermal necrolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Poor |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Feces, unchanged; small amount in urine |
| **Half-life** | 9-14 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ½-1 hr |
| **Peak** | Unknown |
| **Duration** | 24 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression

### Drug classifications

Antihistamines, analgesics (opioids), sedative/hypnotics: increased CNS depression

### Drug/herb

Chamomile, hops, kava, skullcap, valerian: increased CNS depression

Nutmeg: increased antidiarrheal effect

## NURSING CONSIDERATIONS

### Assessment

- Monitor electrolytes (potassium, sodium, chloride) if patient is on long-term therapy; check fluid status, skin turgor
- **Stools:** Assess bowel pattern before, during treatment; check for rebound constipation after termination of medication; check bowel sounds
- Check response after 48 hr; if no response, product should be discontinued and other treatment initiated
- Assess for abdominal distention, toxic megacolon, which may occur in ulcerative colitis
- Assess for dehydration, CNS symptoms in children or those with hepatic disease
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, breastfeeding is not recommended

### Patient/family education

- Caution patient to avoid alcohol and OTC products unless directed by prescriber; may cause increased CNS depression
- Advise patient not to exceed recommended dosage; product may be habit forming; ileostomy patient may take this product for extended time
- Advise patient that product may cause drowsiness and to avoid hazardous activities until response to product is determined
- Teach patient that dry mouth can be decreased by frequent sips of water, hard candy, sugarless gum

### Evaluation

**Positive therapeutic outcome**

- Decreased diarrhea

## loratadine (Rx, OTC)

(lor-a'ti-deen)

**Alavert, Claritin, Children's Claritin RediTabs, Dimetapp, Triaminic Allerchews**

*Func. class.:* Antihistamine (2nd generation)

*Chem. class.:* Selective histamine ($H_1$) receptor antagonist

**Do not confuse:** loratadine/lovastatin/LORazepam/losartan

**ACTION:** Binds to peripheral histamine receptors, which provides antihistamine action without sedation

**Therapeutic outcome:** Decreased nasal stuffiness, itching, swollen eyes

**USES:** Seasonal rhinitis, chronic idiopathic urticaria for those ≥2 yr

## CONTRAINDICATIONS

Hypersensitivity, acute asthma attacks, lower respiratory tract disease

**Precautions:** Pregnancy, increased intraocular pressure, bronchial asthma, breastfeeding, hepatic/renal disease

## DOSAGE AND ROUTES

**Adult and child ≥6 yr:** PO 10 mg/day
**Child 2-5 yr:** PO 5 mg/day

### Renal dose

**Adult:** PO CCr <30 ml/min 10 mg every other day
**Child 2-5 yr:** PO GFR <50 ml/min 5 mg every other day

### Hepatic dose

**Adult:** PO 10 mg every other day

**Available forms:** Tabs 10 mg; rapid-disintegrating tabs 10 mg; orally disintegrating tabs 10 mg; syr 1 mg/ml; susp 5 mg/ml; ext rel tabs 10 mg

### Implementation

- Give on an empty stomach, 1 hr before or 2 hr after meals to facilitate absorption
- **Rapid-disintegrating tabs:** Place rapidly disintegrating tabs on tongue, then swallow after disintegrated with or without water

- Use within 6 mo of opening pouch; immediately after opening blister pack
- Store in airtight, light-resistant container
- **Ext rel tab:** Do not break, crush, or chew

## ADVERSE EFFECTS

**CNS:** Sedation (more common with increased dosages), headache, fatigue, restlessness
**EENT:** Dry mouth

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Liver, extensively, to active metabolite desloratadine |
| **Excretion** | Kidneys |
| **Half-life** | 17-28 hr |

### Pharmacodynamics

| | |
|---|---|
| **Peak** | 1.3-2.5 hr |
| **Duration** | >24 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
Cimetidine, ketoconazole: increased loratadine level

### Drug classifications

Antidepressants, antihistamines (other), sedative-hypnotics: increased CNS depression
Macrolides (clarithromycin, erythromycin): increased loratadine level

### Drug/lab test

False negative: skin allergy tests (discontinue antihistamine 3 days before testing)

## NURSING CONSIDERATIONS

### Assessment

- **Assess allergy:** hives, rash, rhinitis
- Assess respiratory status: rate, rhythm, increase in bronchial secretions, wheezing, chest tightness
- **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding
- **Beers:** Avoid in older men, may decrease urinary flow and cause urinary retention

### Patient/family education

- Teach all aspects of product uses; to notify prescriber if confusion, sedation, hypotension occur; to avoid driving and other hazardous activity if drowsiness occurs; to avoid alcohol and other CNS depressants that may potentiate effect
- Teach patient to take 1 hr before or 2 hr after meals to facilitate absorption
- Advise patient to use sunscreen or stay out of the sun to prevent burns
- Caution patient not to exceed recommended dosage; dysrhythmias may occur
- Teach patient that hard candy, gum, frequent rinsing of mouth may be used for dryness

### Evaluation

**Positive therapeutic outcome**

- Absence of runny or congested nose, other allergy symptoms

**⚠ HIGH ALERT**

## LORazepam (Rx)

(lor-az′e-pam)
**Ativan**
*Func. class.:* Sedative-hypnotic, antianxiety agent
*Chem. class.:* Benzodiazepine, short acting
**Controlled substance schedule IV**

**Do not confuse:** LORazepam/ALPRAZolam/clonazePAM

**ACTION:** Potentiates the actions of GABA, an inhibitory neurotransmitter, especially in the limbic system and reticular formation, which depresses the CNS

**Therapeutic outcome:** Decreased anxiety, relaxation

**USES:** Anxiety, irritability in psychiatric or organic disorders, preoperatively; adjunct in endoscopic procedures, status epilepticus

**Unlabeled uses:** Antiemetic before chemotherapy, rectal use, insomnia

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity to benzodiazepines/benzyl alcohol, closed-angle glaucoma, psychosis, history of drug abuse, COPD, sleep apnea

**Precautions:** Geriatric, debilitated patients, children <12 yr, renal/hepatic disease, addiction, suicidal ideation, abrupt discontinuation

**BLACK BOX WARNING:** Coadministration with other CNS depressants

## DOSAGE AND ROUTES

### Anxiety

**Adult/adolescent:** PO 2-3 mg/day in divided doses, max 10 mg/day
**Geriatric:** PO 1-2 mg/day in divided doses, or 0.5-1 mg at bedtime

### Insomnia (unlabeled)

**Adult:** PO 2-4 mg at bedtime; only minimally effective after 2 wk continuous therapy
**Geriatric:** PO 0.5-1 mg initially

### Preoperatively for sedation

**Adult:** IM 50 mcg/kg 2 hr before surgery; **IV** 44 mcg/kg 15-20 min before surgery, max 2 mg 15-20 min before surgery
**Child ≥12 yr:** **IV** 0.05 mg/kg

### Status epilepticus

**Neonate:** **IV** 0.05 mg/kg
**Child:** **IV** 0.1 mg/kg up to 4 mg/dose; RECT (unlabeled) 0.05-0.1 mg × 2; wait 7 min before giving 2nd dose

### Sedation in mechanically ventilated patients (unlabeled)

**Adult/adolescent (intermittent):** **IV** 0.044 mg/kg q2-4hr, prn, max 4 mg

### Single-dose IV (infusion)

**Adult/adolescent:** 0.5-8 mg/hr titrate, use loading dose of 2-4 mg

**Available forms:** Tabs 0.5, 1, 2 mg; inj 2, 4 mg/ml; oral sol 2 mg/ml

### Implementation

**PO route**

- Give largest dose before bedtime if giving in divided dose
- **Concentrate:** use calibrated dropper; add to food/drink, consume immediately
- Give with food or milk for GI symptoms; crush tab if patient is unable to swallow medication whole; provide sugarless gum, hard candy, frequent sips of water for dry mouth

**SUBCUT route**

- Use by SUBCUT route for rapid response (investigational use)

**IM route**

- Give deep in muscle mass; if using for preoperative sedation, give 2 hr or more before surgical procedure
- Use this route when IV route is not feasible

**Direct IV route**

- Prepare immediately before use; short stability time
- Dilute with sterile water for inj, 0.9% NaCl, or $D_5W$ just before using; give by Y-site or 3-way stopcock at 2 mg/min
- Do not use sol that is discolored or contains a precipitate
- Do not use in neonates (benzyl alcohol)

**Y-site compatibilities:** Acetaminophen, acyclovir, albumin, allopurinol, amifostine, amikacin, amoxicillin, amoxicillin/clavulanate, amphotericin B cholesteryl, amsacrine, atenolol, atracurium, bivalirudin, bleomycin, bumetanide, butorphanol, calcium chloride/gluconate, CARBOplatin, ceFAZolin, cefepime, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, ceftobiprole, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, cladribine, clindamycin, cloNIDine, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, diltiazem, DOBUTamine, DOCEtaxel, DOPamine, doripenem, DOXOrubicin, DOXOrubicin liposomal, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, eptifibatide, erythromycin, esmolol, etomidate, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, fosphenytoin, furosemide, ganciclovir, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, haloperidol, heparin, hydrocortisone, HYDROmorphone, hydrOXYzine, ifosfamide, inamrinone, insulin (regular), irinotecan, isoproterenol, ketorolac, labetalol, lidocaine, linezolid, magnesium sulfate, mannitol, mechlorethamine, melphalan, meropenem, metaraminol, methadone, methotrexate, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, micafungin, midazolam, milrinone, minocycline, mitoXANtrone, morphine, mycophenolate, nafcillin, nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, PEMEtrexed, pentamidine, PENTobarbital, PHENobarbital, piperacillin, piperacillin-tazobactam, polymyxin B, potassium chloride, propofol, ranitidine, remifentanil, tacrolimus, teniposide, theophylline, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, TPN, trastuzumab, trimethobenzamide, trimethoprim-sulfamethoxazole, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, voriconazole, zidovudine

**Y-site incompatibilities:** IDArubicin, ondansetron, sargramostim

## ADVERSE EFFECTS

**CNS:** *Dizziness, drowsiness,* confusion, headache, anxiety, tremors, stimulation, fatigue, depression, insomnia, hallucinations, weakness, unsteadiness
**CV:** *Orthostatic hypotension,* ECG changes, tachycardia, hypotension, apnea, cardiac arrest (IV, rapid)
**EENT:** *Blurred vision,* tinnitus, mydriasis
**GI:** Constipation, dry mouth, nausea, vomiting, anorexia, diarrhea
**INTEG:** Rash, dermatitis, itching
**MISC:** Acidosis

## Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO); completely absorbed (IM) |
| **Distribution** | Widely distributed; crosses placenta, blood-brain barrier |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 42 hr (neonates), 10.5 hr (older child), 12 hr (adult), 91% protein bound |

## Pharmacodynamics

| | PO | IM | IV |
|---|---|---|---|
| **Onset** | 1 hr | 15-30 min | |
| **Peak** | 1-2 hr | 1-1½ hr | 1-1.5 hr |
| **Duration** | 12-24 hr | 6-8 hr | 6-8 hr |

# INTERACTIONS

### Individual drugs

**BLACK BOX WARNING:** Alcohol: increased CNS depression

Disulfiram: increased LORazepam effects
Hormonal contraceptives, valproic acid: decreased LORazepam effects

### Drug classifications

**BLACK BOX WARNING:** CNS depressants, opioids: increased LORazepam effects

### Drug/herb

Chamomile, hops, kava, lavender, valerian: increased CNS depression

### Drug/lab test

Increased: AST, ALT

# NURSING CONSIDERATIONS

### Assessment

- Assess degree of anxiety; what precipitates anxiety and whether product controls symptoms; other signs of anxiety: dilated pupils, inability to sleep, restlessness, inability to focus
- Assess for alcohol withdrawal symptoms, including hallucinations (visual, auditory), delirium, irritability, agitation, fine to coarse tremors
- **Beers:** Avoid in older adults, may increase cognitive impairment, delirium

**BLACK BOX WARNING:** Coadministration with other CNS depressants (especially opioids) should be avoided, if used together, use lower dose

- Monitor B/P (with patient lying/standing), pulse; check respiratory rate; if systolic B/P drops 20 mm Hg, hold product, notify prescriber; respirations q5-15min if given **IV**
- Monitor CBC during long-term therapy; blood dyscrasias have occurred (rare)
- Monitor for seizure control; type, duration, and intensity of seizures; what precipitates seizures
- Monitor hepatic studies: AST, ALT, bilirubin, creatinine, LDH, alkaline phosphatase
- Assess mental status: mood, sensorium, affect, sleeping pattern, drowsiness, dizziness, suicidal tendencies, and ability of product to control these symptoms; check for tolerance, withdrawal symptoms: headache, nausea, vomiting, muscle pain, weakness after long-term use

### Patient/family education

- Teach patient to notify prescriber if pregnancy is planned or suspected; do not breastfeed, use contraception
- Advise patient that product may be taken with food; that product is not to be used for everyday stress or used longer than 4 mo unless directed by a prescriber; to take no more than prescribed amount; may be habit forming

**BLACK BOX WARNING:** Caution patient to avoid OTC preparations unless approved by prescriber; to avoid alcohol, other psychotropic medications unless prescribed by physician, notify prescriber immediately trouble breathing, dizziness, coma, no response; not to discontinue medication abruptly after long-term use

- Inform patient to avoid driving and activities that require alertness; drowsiness may occur; to rise slowly or fainting may occur, especially in geriatric
- Inform patient that drowsiness may worsen at beginning of treatment
- Teach patient/family to report suicidal ideation

### Evaluation

**Positive therapeutic outcome**

- Decreased anxiety, restlessness, insomnia

# TREATMENT OF OVERDOSE:

Lavage, VS, supportive care

## lorcaserin

(lor-ca-ser′in)

**Belviq**

*Func. class.:* Appetite suppressant

*Chem. class.:* Serotonin 2C ($5\text{-HT}_{2C}$) receptor agonist

**Controlled substance IV**

**ACTION:** Decreases food consumption and decreases hunger by selectively activating $5\text{-HT}_{2C}$ receptors

**Therapeutic outcome:** Decrease in weight

**USES:** Obesity management

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity, severe renal impairment

**Precautions:** Children, other organic causes of obesity, anemia, AV block, bradycardia, bundle branch block, depression, dialysis, liver/kidney disease, multiple myeloma, neutropenia, suicidal ideation, Peyronie's disease, pulmonary hypertension, sick sinus syndrome

## DOSAGE AND ROUTES

### Renal dose

**Adult:** PO 10 mg bid; do not exceed recommended dosage; discontinue after 12 wk if weight loss has not been achieved

**Available forms:** Tabs, film-coated 10 mg

### Implementation

- Identify obesity if patient is on weight reduction program that includes dietary changes, exercise
- May give without regard to food

## ADVERSE EFFECTS

**CNS:** Insomnia, depression, serotonin syndrome, anxiety, suicidal ideation, dizziness, headache, fatigue
**CV:** Bradycardia, hypertension
**GI:** Diarrhea, constipation, nausea
**HEMA:** Neutropenia, leukopenia, lymphopenia
**INTEG:** Rash
**MS:** Back pain

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 70% protein binding |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 11 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Linezolid, buPROPion, lithium, sibutramine, traMADol: increased life-threatening serotonin syndrome
Insulin: increased risk of hypoglycemia with this product

### Drug classifications

SSRIs, SNRIs, serotonin receptor agonists, MAOIs, tricyclic antidepressants: increased life-threatening serotonin syndrome
Sulfonylureas: increased risk of hypoglycemia with this product

### Drug/lab test

Increase: Prolactin
Decrease: Glucose, Hct, WBC, RBC

### Drug/herb

St. John's wort: increased serotonin syndrome

## NURSING CONSIDERATIONS

### Assessment

- Monitor weight weekly; oral hypoglycemic dosage might need to be reduced in diabetic patients
- Monitor blood glucose, CBC with differential, Hct/Hgb, serum prolactin
- **Pregnancy, breastfeeding:** do not use in pregnancy, baseline and periodically
- **Suicidal ideation:** use caution in psychiatric disorders with emotional lability; assess for depression, suicidal thoughts/behaviors, hostility, irritability
- **Serotonin syndrome:** Assess for nausea, vomiting, diarrhea, confusion, tachycardia, hyperthermia, if these occur stop product, notify prescriber

### Patient/family education

- Advise patient to avoid hazardous activities until stabilized on medication
- Inform patient to discuss unpleasant side effects
- Teach patient to notify prescriber if pregnancy is planned or suspected, do not use in pregnancy, breastfeeding
- Teach patient to use in conjunction with diet, exercise

### Evaluation
**Positive therapeutic outcome**
- Decrease in weight

## losartan (Rx)
(low-sar′tan)
**Cozaar**
*Func. class.:* Antihypertensive
*Chem. class.:* Angiotensin II receptor (type $AT_1$)

**Do not confuse:** losartan/valsartan, Cozaar/Zocor

**ACTION:** Blocks the vasoconstrictor and aldosterone-secreting effects of angiotensin II; selectively blocks the binding of angiotensin II to the $AT_1$ receptor found in tissues

**Therapeutic outcome:** Decreased B/P

**USES:** Hypertension, alone or in combination; nephropathy in type 2 diabetes, proteinuria, stroke prophylaxis in hypertensive patients with left ventricular hypertrophy

## CONTRAINDICATIONS
Hypersensitivity

**BLACK BOX WARNING:** Pregnancy (2nd/3rd trimesters) pregnancy (1st trimester), breastfeeding, children, geriatric, hypersensitivity to ACE inhibitors, hepatic disease, angioedema, renal artery stenosis, African descent, hyperkalemia, hypotension

## DOSAGE AND ROUTES
### Hypertension
**Adult:** PO 50 mg/day alone or 25 mg/day when used in combination with diuretic; maintenance 25-100 mg/day
**Child ≥6 yr:** PO 0.7 mg/kg/day, max 50 mg/day

### Hepatic dose
**Adult:** PO 25 mg/day as starting dose/volume depletion

### Hypertension with left ventricular hypertrophy (benefit does not apply to those of African descent)
**Adult:** PO 50 mg/day, add hydrochlorothiazide 12.5 mg/day and/or increase losartan to 100 mg/day, then increase hydrochlorothiazide to 25 mg/day

### Nephropathy in type 2 diabetes patients
**Adult:** PO 50 mg/day, may increase to 100 mg/day

**Available forms:** Tabs 25, 50, 100 mg

### Implementation
- Administer without regard to meals
- If product is compounded into a suspension, store in refrigerator and shake well before use
- May use alone or in combination

## ADVERSE EFFECTS
**CNS:** *Dizziness, insomnia,* anxiety, confusion, abnormal dreams, migraine, tremor, vertigo, headache, malaise, depression, fatigue
**CV:** Angina pectoris, 2nd-degree AV block, CVA, *hypotension,* MI, dysrhythmias
**EENT:** Blurred vision, burning eyes, conjunctivitis
**GI:** *Diarrhea, dyspepsia,* anorexia, constipation, dry mouth, flatulence, gastritis, vomiting
**GU:** Impotence, nocturia, urinary frequency, urinary tract infection, renal failure
**HEMA:** Anemia, thrombocytopenia
**INTEG:** Alopecia, dermatitis, dry skin, flushing, photosensitivity, rash, pruritus, sweating angioedema
**META:** Gout, hyperkalemia, hypoglycemia
**MS:** Cramps, myalgia, pain, stiffness
**RESP:** *Cough, upper respiratory infection,* congestion, dyspnea, bronchitis
**MISC:** Diabetic vascular disease

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Bound to plasma proteins |
| **Metabolism** | Extensive |
| **Excretion** | Feces, urine |
| **Half-life** | Biphasic, 2 hr, 6-9 hr |

### Pharmacodynamics
Unknown

## INTERACTIONS
### Individual drugs
Fluconazole: increased antihypertensive effect
Lithium: increased toxicity
PHENobarbital, rifamycin: decreased antihypertensive effect

### Drug classifications
ACE inhibitors, diuretics (potassium-sparing), potassium supplements: increased hyperkalemia
NSAIDs, salicylates: decreased antihypertensive effect

### Drug/lab test
Increase: AST/ALT

### Drug/herb
Ma huang: Decrease antihypertensive effects

## NURSING CONSIDERATIONS

### Assessment

- Assess B/P with position changes, pulse q4hr; note rate, rhythm, quality, Black patients should use combination therapy for better control of B/P
- Monitor electrolytes: potassium, sodium, chloride
- Obtain baselines for renal, electrolyte, liver function tests before therapy begins
- **HF:** assess for jugular vein distention, weight daily, edema in feet, legs daily
- **Angioedema:** facial swelling, dyspnea, wheezing, may occur rapidly, tongue swelling (rare)
- **Blood dyscrasias:** thrombocytopenia, anemia (rare)

**BLACK BOX WARNING:** Pregnancy before starting treatment; not to use in pregnancy, breastfeeding

### Patient/family education

- Teach patient to avoid sunlight or wear sunscreen if in sunlight; photosensitivity may occur
- Advise patient to comply with dosage schedule, even if feeling better
- Teach patient to notify prescriber of mouth sores, fever, swelling of hands or feet, irregular heartbeat, chest pain
- Advise patient that excessive perspiration, dehydration, vomiting, diarrhea may lead to fall in blood pressure, consult prescriber if these occur
- Inform patient that product may cause dizziness, fainting; light-headedness may occur, to avoid hazardous activities until reaction is known
- Caution patient to rise slowly to sitting or standing position to minimize orthostatic hypotension

**BLACK BOX WARNING:** Advise patient to use contraception while taking this product, pregnancy not to breastfeed

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P

## loteprednol ophthalmic

*See Appendix B*

## lovastatin (Rx)

(loe′va-sta-tin)

**Altoprev, Mevacor (mevinolin)**

*Func. class.:* Antilipemic

*Chem. class.:* HMG-CoA reductase inhibitor

**Do not confuse:** lovastatin/Lotensin

**ACTION:** By inhibiting HMG-CoA reductase, which reduces cholesterol synthesis

**Therapeutic outcome:** Decreased cholesterol levels and LDL, increased HDL

**USES:** As an adjunct in primary hypercholesterolemia (types IIa, IIb), atherosclerosis, heterozygous familial hypercholesterolemia (adolescents)

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity, active liver disease

**Precautions:** Past liver disease, alcoholism, severe acute infections, trauma, hypotension, uncontrolled seizure disorders, severe metabolic disorders, electrolyte imbalances, visual condition, children

## DOSAGE AND ROUTES

### To prevent/treat CAD, hyperlipidemia

**Adult:** PO 20 mg/day with evening meal; may increase to 20-40 mg/day in single or divided doses at 4-wk intervals; max 40 mg/day; ext rel 20-60 mg/day at bedtime; max 40 mg/day

### Heterozygous familial hypercholesterolemia

**Adolescent 10-17 yr:** PO 10-40 mg with evening meal

### Primary prevention of CV disease

**Adult 45-75 yr with type 1 or 2 diabetes:** PO 40 mg immediate-release

### Secondary prevention of CV disease

**Adult >75 yr (not a candidate for high-intensity use):** 40 mg immediate-release qday

### Renal dose

**Adult:** PO CCr <30 mg/min max 20 mg/day unless titrated

**Available forms:** Tabs 10, 20, 40 mg; ext rel tab 10, 20, 40, 60 mg

### Implementation

- Give with evening meal; if dosage is increased, take with breakfast and evening meal (immediate release); use at bedtime
- Altroprev is not equivalent to Mevacor

• Store in cool environment in airtight, light-resistant container
• Do not crush or chew ext rel tab

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, tremor, insomnia, paresthesia
**EENT:** Blurred vision, lens opacities
**GI:** Nausea, constipation, diarrhea, dyspepsia, *flatus,* abdominal pain, heartburn, liver dysfunction, vomiting, acid regurgitation, dry mouth, dysgeusia
**HEMA:** Thrombocytopenia, hemolytic anemia, leukopenia
**INTEG:** Rash, pruritus, photosensitivity
**MS:** Muscle cramps, myalgia, myositis, rhabdomyolysis; leg, shoulder, or localized pain

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Poorly absorbed, erratic |
| **Distribution** | Crosses placenta, blood-brain barrier |
| **Metabolism** | Liver, extensively |
| **Excretion** | Feces (83%); kidneys, urine (10%) |
| **Half-life** | 3-4 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Bosentan, exenatide: decreased action of lovastatin
Clarithromycin, clofibrate, cycloSPORINE, danazol, diltiazem, erythromycin, gemfibrozil, niacin, quinupristin-dalfopristin, telithromycin, verapamil: increased myalgia, myositis, rhabdomyolysis; avoid concurrent use
Diltiazem: increased lovastatin effects
Warfarin: increased bleeding

### Drug classifications

Azole antifungals, protease inhibitors: increased myositis, myalgia, rhabdomyolysis
Bile acid sequestrants: decreased lovastatin effects

### Drug/herb

Pectin, St. John's wort: decreased effect
Red yeast rice: increased adverse reactions

### Drug/food

Increased levels of lovastatin with food, must be taken with food
Grapefruit juice: increased toxicity
Oat bran: decreased absorption

### Drug/lab test

Increased: CPK, liver function tests
Interference: T3, T4, T7, TSH

## NURSING CONSIDERATIONS

### Assessment

• Assess nutrition: fat, protein, carbohydrates; nutritional analysis should be completed by dietitian before treatment
• Monitor bowel pattern daily; diarrhea may be a problem
• Monitor triglycerides, fasting cholesterol LDL, HDL at baseline, throughout treatment; watch LDL and VLDL closely; if increased, product should be discontinued
• Assess for muscle pain, tenderness, obtain CPK; if these occur, product may need to be discontinued
• **Rhabdomyolysis:** muscle pain, increased CPK, weakness, swelling of affected muscles; if these occur and if confirmed by CPK, product should be discontinued

### Patient/family education

• Inform patient that compliance is needed for positive results to occur; not to double doses
• Inform patient that blood work and ophthalmic exam will be necessary during treatment
• Teach patient that risk factors should be decreased: high-fat diet, smoking, alcohol consumption, absence of exercise
• Advise patient to report if pregnancy is suspected, pregnancy X, do not breastfeed, do not use in pregnancy
• Advise patient to notify prescriber if the GI symptoms of diarrhea, abdominal or epigastric pain, nausea, vomiting occur; or if chills, fever, sore throat, blurred vision, dizziness, headache, muscle pain, weakness occur
• Advise patient to stay out of the sun or use sunscreen to prevent burns
• Instruct patient that product should be taken with food, not to crush, chew ext rel product, to take immediate-release product in the AM and extended-release product at bedtime
• Teach patient not to use with grapefruit juice, large amounts of alcohol
• Teach patient to protect from light, moisture

### Evaluation

#### Positive therapeutic outcome

• Decreased cholesterol, serum triglyceride levels
• Improved level of HDL

## lurasidone (Rx)

(loo-ras'i-done)

**Latuda**

*Func. class.:* Atypical antipsychotic

*Chem. class.:* Dopamine-serotonin receptor antagonist

**Do not confuse:** Latuda/Lantus

**ACTION:** May modulate central dopaminergic and serotoninergic activity, high affinity for dopamine-$D_2$ receptors, serotonin 5-$HT_{2A}$ receptors, and partial agonist at serotonin 5-$HT_{1A}$ receptor

**Therapeutic outcome:** Decreasing hallucinations, delusions, agitation, social withdrawal

**USES:** Schizophrenia, depression associated with bipolar disorder I

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Abrupt discontinuation, ambient temperature increase, breast cancer, breastfeeding, cardiac disease, children, dehydration, diabetes, ketoacidosis, driving/operating machinery, dysphagia, geriatrics, heart failure, hematological/hepatic/renal disease, hypotension, hypovolemia, MI, infertility, obesity, Parkinson's disease, pregnancy, seizures, strenuous exercise, stroke, substance abuse, suicidal ideation, syncope, tardive dyskinesia

**BLACK BOX WARNING:** Dementia: antipsychotics, such as lurasidone, are not approved for the treatment of dementia-related psychosis in geriatric patients and may increase the risk of death in this population, children, suicidal ideation

## DOSAGE AND ROUTES

### Schizophrenia

**Adult:** PO 40 mg/day, range 40-160 mg/day, those receiving CYP3A4 inhibitors max 80 mg/day, do not use with strong CYP3A4 inducers/inhibitors

### Bipolar disorder I

**Adult:** PO 20 mg qday, max 120 mg/day

### Hepatic/renal dose

**Adult:** PO CCr <50 ml/min, hepatic disease CTPA start dose 20 mg/day, max 80 mg/day; hepatic disease CTP B start dose 20 mg/day, max 40 mg/day

**Available forms:** 20, 40, 80, 120 mg tabs

### Implementation

- Give with a meal of at least 350 calories
- Store at room temperature, protect from moisture

## ADVERSE EFFECTS

**CNS:** Agitation, akathisia, anxiety, dizziness, drowsiness, fatigue, hyperthermia, insomnia, dystonic reactions; neuroleptic malignant syndrome (rare), pseudoparkinsonism, restlessness, seizures, suicidal ideation, syncope, tardive dyskinesia, vertigo

**CV:** Angina, AV block, bradycardia, hypertension, orthostatic hypotension, sinus tachycardia, stroke

**EENT:** Blurred vision

**ENDO:** Diabetes mellitus, ketoacidosis, hyperglycemia, hyperprolactinemia

**GI:** Abdominal pain, diarrhea, dyspepsia, nausea, vomiting, gastritis, weight gain/loss

**GU:** Amenorrhea, breast enlargement, dysmenorrhea, impotence, dysuria, renal failure

**HEMA:** Agranulocytosis, anemia, leucopenia, neutropenia

**INTEG:** Pruritus, rash

**MS:** Back pain, dysarthria; rhabdomyolysis (rare)

**SYST:** Angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 9%-19% |
| **Distribution** | 99% protein binding |
| **Metabolism** | Unknown |
| **Excretion** | 80% feces, 9% urine |
| **Half-life** | 18 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-3 hr |
| **Duration** | Steady state 7 days |

## INTERACTIONS

### Individual drugs

Metoclopramide: do not use concurrently

### Drug classifications

Other CNS depressants, alcohol: increased sedation

Strong CYP3A4 inhibitors: increased lurasidone effect, do not use concurrently

SSRIs, SNRIs: increased serotonin syndrome, neuroleptic malignant syndrome

### Drug/herb

St. John's wort: Decrease: Product effect, do not use together

### Drug/food

Not to use with grapefruit juice

## NURSING CONSIDERATIONS

### Assessment

- **Assess for schizophrenia:** hallucinations, delusions, agitation, social withdrawal; monitor orientation, behavior, mood prior to and periodically during therapy
- **Assess for neuroleptic malignant syndrome (rare):** fever, dyspnea, tachycardia, seizures, sweating, hypertension, hypotension, muscle stiffness, pallor, report immediately
- **Monitor for blood dyscrasias:** CBC periodically, blood dyscrasias may occur
- **Monitor for serious cardiac symptoms:** AV block, stroke, bradycardia may occur
- Assess AIMS assessment, thyroid function tests, LFTs, lipid panel, electrolytes
- **Assess for EPS:** restlessness, difficulty speaking, loss of balance, pill rolling, masklike face, shuffling gait, rigidity, tremors, muscle spasms; monitor prior to and periodically during therapy; report tardive dyskinesia immediately

**BLACK BOX WARNING: Dementia:** This product is not approved for the elderly with dementia-related psychosis

- Monitor for weight gain, hyperglycemia, metabolic changes in diabetes
- **Coadministration with other CNS depressants (opioids). If given together, assess for excessive sedation, slow breathing, avoid concurrent use**

**BLACK BOX WARNING:** Suicidal ideation/children: Avoid use in children, may be risk of suicide in young adults (<24 yr) and children; assess for worsening depression, suicidal thoughts/behaviors, product should be dispensed in small quantities

- **Beers:** Avoid in older adults except for schizophrenia, bipolar disorder, short-term use as an antiemetic for chemotherapy, increased risk of stroke, cognitive decline

### Patient/family education

- Explain reason for treatment and expected results
- **Teach patient to report EPS, blood dyscrasias:** sore throat, fever, unusual bleeding/bruising
- Teach patient that lab work will be needed regularly
- Advise patient to avoid hazardous activities until response is known
- Teach patient to avoid OTC products unless approved by prescriber, serious reaction may occur, not to use grapefruit juice, alcohol
- Teach patient to report fast heartbeat, extra beats, trouble breathing, sweating, stiffness

**BLACK BOX WARNING:** Suicidal ideation/children: Teach patient/family to be aware and report immediately worsening depression, suicidal thoughts/behaviors, hostility, irritability

### Evaluation

**Positive therapeutic outcome**

- Decreasing hallucinations, delusions, agitation, social withdrawal

## luliconazole topical

*See Appendix B*

labetalol (Rx)
lamiVUDine (3TC) (Rx)
lapatinib (Rx)
leflunomide (Rx)
leuprolide (Rx)
levobetaxolol ophthalmic
levodopa-carbidopa (Rx)
levomilnacipran
lidocaine topical
linezolid (Rx)
lithium (Rx)
loperamide (OTC, Rx)
lorcaserin
lovastatin (Rx)
lacosamide (Rx)
lamoTRIgine (Rx)
latanoprost ophthalmic
letrozole (Rx)
levalbuterol (Rx)
levobunolol ophthalmic
levofloxacin (Rx)
levothyroxine (Rx)
linagliptin
liraglutide (Rx)
lixisenatide
loratadine (Rx, OTC)
losartan (Rx)
lurasidone (Rx)
lactulose (Rx)
lansoprazole (Rx, OTC)
ledipasvir/sofosbuvir
leucovorin (Rx)
levETIRAcetam (Rx)
levocabastine ophthalmic
levofloxacin ophthalmic
lidocaine, parenteral (Rx)
lindane (OTC)
lisinopril (Rx)
lodoxamide ophthalmic
LORazepam (Rx)
loteprednol ophthalmic
luliconazole topical

## mafenide topical

*See Appendix B*

## magaldrate (OTC)

(mag′al-drate)

**Isopan, Losapan, Riopan, Riopan Extra Strength**

*Func. class.:* Antacid

*Chem. class.:* Aluminum/magnesium hydroxide

**ACTION:** Neutralizes gastric acidity; product is dissolved in gastric contents; this product is a combination of aluminum and magnesium

**Therapeutic outcome:** Decreased pain of ulcers

**USES:** Antacid, hiatal hernia, indigestion/heartburn, hyperacidity

**Unlabeled uses:** Duodenal and gastric ulcers, peptic ulcer disease (adjunct), reflex esophagitis

### CONTRAINDICATIONS

Hypersensitivity to this product or benzyl alcohol

**Precautions:** Pregnancy, geriatric, fluid restriction, decreased GI motility, GI obstruction, dehydration, renal disease, sodium-restricted diets, bone disease, hypertension, appendicitis, diverticulitis, ulcerative colitis, neonates/infants, hypermagnesemia, hypophosphatemia

### DOSAGE AND ROUTES

**Adult/child/geriatric:** SUSP 5-10 ml (480-1080 mg) with water between meals, at bedtime

**Available forms:** SUSP 540 mg/5 ml

#### Implementation

- Take antacids 2 hr before or 2 hr after taking enteric-coated products
- Give laxatives or stool softeners if constipation occurs
- Give SUSP after shaking; give between meals and at bedtime
- Give when stomach is empty after meals and at bedtime

### ADVERSE EFFECTS

**GI:** Constipation, diarrhea, anorexia

**META:** Hypermagnesemia, hypophosphatemia

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Not absorbed |
| **Distribution** | Not distributed |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys |
| **Half-life** | Unknown |

#### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | ½ hr |
| **Duration** | 1 hr |

### INTERACTIONS

#### Individual drugs

ChlordiazePOXIDE, cimetidine, isoniazid, ketoconazole, phenytoin, tetracycline: decreased absorption of each specific product

Flecainide, quiNIDine: increased action when taken in large amounts

#### Drug classifications

Amphetamines: increased action when taken in large amounts

Anticholinergics, corticosteroids, fluoroquinolones, iron salts, phenothiazines, salicylates: decreased absorption of each specific product

Salicylates: decreased action when taken in large amounts

### NURSING CONSIDERATIONS

#### Assessment

- **Antacid:** location of pain, intensity, characteristics, what aggravates, ameliorates pain; heartburn/indigestion; hematemesis
- Monitor serum magnesium, calcium, phosphate, potassium if using long term or with impaired renal function
- Assess for constipation: increase bulk in diet if needed or obtain order for stool softener

#### Patient/family education

- Advise patient to separate ingestion of enteric-coated products and antacid by 2 hr
- Advise patient to use product 2 wk or less; product should not be used for long periods
- Teach patient to notify prescriber immediately if coffee-ground emesis, emesis with frank blood, or black tarry stools occur

#### Evaluation

**Positive therapeutic outcome**

- Absence of abdominal pain
- Decreased acidity

## magnesium salts

(mag-neez′ee-um)

**magnesium chloride (Rx)**

**Mag-64**

**magnesium citrate (OTC)**

**magnesium gluconate (OTC)**

**Magtrate**

## magnesium hydroxide (OTC)

**Dulcolax, Phillips Milk of Magnesia, MOM**

## magnesium oxide (OTC)

**Mag-Ox 400, Uro-Mag**

**⚠ HIGH ALERT**

## magnesium sulfate (OTC, Rx)

**(IV)— HIGH ALERT**

*Func. class.:* Electrolyte; anticonvulsant, laxative, saline; antacid

**ACTION:** Increases osmotic pressure, draws fluid into colon, neutralizes HCl

**Therapeutic outcome:** Magnesium levels WNL, absence of constipation

**USES:** Constipation, dyspepsia, bowel preparation before surgery or exam, electrolyte, anticonvulsant, in preeclampsia, eclampsia (magnesium sulfate); cardiac glycoside-induced arrhythmias, nutritional supplement

## CONTRAINDICATIONS

Hypersensitivity, abdominal pain, nausea/vomiting, obstruction, acute surgical abdomen, rectal bleeding, heart block, myocardial damage

**Precautions:** Pregnancy (magnesium sulfate), renal disease/cardiac disease

## DOSAGE AND ROUTES

### Laxative

**Adult:** PO 15-60 ml at bedtime (Milk of Magnesia)

**Adult and child >12 yr:** PO 15 g in 8 oz of $H_2O$ (magnesium sulfate); PO 5-30 ml (Concentrated Milk of Magnesia); PO 5-10 oz at bedtime (magnesium citrate)

**Child 2-6 yr:** 5-15 ml/day (Milk of Magnesia)

### Prevention of magnesium deficiency

**Adult and child ≥10 yr:** PO (male): 350-400 mg/day; (female): 280-300 mg/day; (breastfeeding): 335-350 mg/day; (pregnancy): 320 mg/day

**Child 8-10 yr:** PO 170 mg/day

**Child 4-7 yr:** PO 120 mg/day

### Magnesium sulfate deficiency

**Adult:** PO 200-400 mg in divided doses tid-qid; IM 1 g q6hr × 4 doses; **IV** 5 g (severe)

**Child 6-12 yr:** 3-6 mg/kg/day in divided doses tid-qid

### Preeclampsia/eclampsia magnesium sulfate

**Adult:** IM/**IV** INF 4-5 g; with 5 g IM in each gluteus, then 5 g q4hr or 4 g **IV** INF, then 1-3 g/hr cont INF, max 40 g/day or 20 g/48 hr in severe renal disease

**Available forms: Chloride:** sus rel tabs 535 mg (64 mg Mg); enteric tabs 833 mg (100 mg Mg); **hydroxide:** liquid 400 mg/5 ml (164 mg Mg/5 ml); conc liquid 800 mg/5 ml (328 mg Mg/5 ml); chew tabs 300, 600 mg; **Gluconate:** tabs 500 mg; liquid 54 mg/5 ml; **oxide:** tabs 400 mg (241.3 mg Mg); caps 140 mg (84.5 mg Mg); **sulfate:** 500 mg/ml; premixed infusion 1g/100 ml, 2 g/100 ml, 4 g/50 ml, 4 g/100 ml, 20 g/500 ml, 40 g/1000 ml; **citrate:** oral sol 240, 296, 300 ml bottles (77 mEq/100 ml)

### Implementation

**PO route**

- Administer with 8 oz of water
- Refrigerate magnesium citrate before administration
- Shake susp before using
- Administer to patient crushed or whole; chewable tablets may be chewed
- Administer with food or milk to decrease gastric symptoms; give 30 min before or 2 hr after antacids
- Tablets should be chewed thoroughly before swallowing, give 4 oz of water afterward
- **Laxative:** give on empty stomach

**IM route (magnesium sulfate)**

- Give deeply in gluteal site

**IV route (magnesium sulfate)**

- Only when calcium gluconate available for magnesium toxicity

**Direct IV route**

- Dilute 50% solution to 20% or less give at ≤150 mg/min

**Continuous IV INF route**

- May dilute to 20% sol, infuse over 3 hr
- IV at less than 125 mg/kg/hr; circulatory collapse may occur; use inf pump

**Y-site compatibilities:** Acyclovir, aldesleukin, alemtuzumab, alfentanil, amifostine, amikacin, aminocaproic acid, argatroban, arsenic trioxide, ascorbic acid injection, asparaginase, atenolol, atosiban, atracurium, atropine, azithromycin, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium gluconate, cangrelor, CARBOplatin, carmustine, caspofungin, cefotaxime, cefoTEtan, cefOXitin, ceftAZidime, ceftizoxime, cephapirin, chloramphenicol, chlorproMAZINE, cimetidine, cisatracurium, CISplatin, clindamycin, cloNIDine, codeine, cyanocobalamin, cyclophosphamide, cytarabine, DACTINomycin, DAPTOmycin, DAUNOrubicin liposome, DAUNOrubicin, dexmedetomidine, dexrazoxane, digoxin, diltiazem, dimenhyDRINATE, diphenhydrAMINE,

DOBUTamine, DOCEtaxel, dolasetron, DOPAmine, doripenem, doxacurium chloride, DOXOrubicin liposomal, doxycycline, enalaprilat, EPHEDrine, EPINEPHrine, epoetin alfa, eptifibatide, ertapenem, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, folic acid (as sodium salt), foscarnet, gallium, gatifloxacin, gemcitabine, gemtuzumab, gentamicin, glycopyrrolate, granisetron, heparin, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, insulin, regular, irinotecan, isoproterenol, kanamycin, ketamine, ketorolac, labetalol, lactated ringer's injection, lepirudin, leucovorin, lidocaine, linezolid, LORazepam, mannitol, mechlorethamine, mesna, metaraminol, methotrexate, methyldopate, metoclopramide, metoprolol, metroNIDAZOLE, micafungin, midazolam, milrinone, minocycline, mitoMYcin, mitoXANtrone, mivacurium, morphine, moxifloxacin, multiple vitamins injection, mycophenolate mofetil, nafcillin, nalbuphine, nesiritide, netilmicin, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, papaverine, PEMEtrexed, penicillin G potassium/sodium, pentazocine, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, piperacillin, piperacillin tazobactam, polymyxin B, potassium acetate/chloride, procainamide, prochlorperazine, promethazine, propranolol, protamine, pyridoxine, quiNIDine, quinupristin-dalfopristin, ranitidine, remifentanil, ringer's injection, riTUXimab, rocuronium, sargramostim, sodium acetate/bicarbonate, succinylcholine, SUFentanil, tacrolimus, telavancin, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, TNA (3-in-1), tobramycin, tolazoline, topotecan, TPN (2-in-1), trastuzumab, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, vitamin B complex with C, voriconazole, zoledronic acid

## ADVERSE EFFECTS

**CNS:** Muscle weakness, flushing, sweating, confusion, sedation, depressed reflexes, flaccid paralysis, hypothermia

**CV:** Hypotension, heart block, circulatory collapse, vasodilatation

**GI:** *Nausea, vomiting, anorexia, cramps,* diarrhea

**HEMA:** Prolonged bleeding time

**META:** Electrolyte, fluid imbalances

**RESP:** Respiratory depression/paralysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys |
| **Half-life** | Unknown |
| | effective anticonvulsant levels 2.5-7.5 mEq/L |

### Pharmacodynamics

| | PO | IM | IV |
|---|---|---|---|
| **Onset** | 3-6 hr | 1 hr | Unknown |
| **Peak** | Unknown | Unknown | Unknown |
| **Duration** | Unknown | 4 hr | ½ hr |

## INTERACTIONS

### Individual products

Digoxin: decreased effect of digoxin
Nitrofurantoin: decreased absorption

### Drug classifications

Antihypertensives: increased hypotension, calcium channel blockers
Antiinfectives (fluoroquinolones), tetracyclines: decreased absorption
Neuromuscular blockers: increased effect

## NURSING CONSIDERATIONS

### Assessment

- Assess I&O ratio; check for decrease in urinary output
- **Laxative:** assess cause of constipation; lack of fluids, bulk, exercise
- Assess cramping, rectal bleeding, nausea, vomiting; product should be discontinued
- **Assess magnesium toxicity:** thirst, confusion, decrease in reflexes
- Assess visual changes: blurring, halos, corneal and retinal damage
- Assess edema in feet, ankles, legs
- Assess prior product history; there are many product interactions
- **Eclampsia:** seizure precautions, BP, ECG (magnesium sulfate)
- **Pregnancy/breastfeeding:** Do not use in pregnancy, unless clearly needed, cautious use in breastfeeding, excreted in breast milk

### Patient/family education

#### PO route

- Teach not to use laxatives for long-term therapy; bowel tone will be lost
- Teach that chilling helps the taste of magnesium citrate
- Teach to shake suspension well

- Teach to not use at bedtime as a laxative; may interfere with sleep; MOM is usually given at bedtime
- Teach to give citrus fruit after administering to counteract unpleasant taste
- Teach reason for product, expected result

### Evaluation

**Positive therapeutic outcome**
- Decreased constipation; absence of seizures (eclampsia), normal serum calcium levels

## mannitol (Rx)

(man′i-tole)
**Aridol Bronchial Challenge test kit, Osmitrol, Resectisol**
*Func. class.:* Diuretic-osmotic
*Chem. class.:* Hexahydric alcohol

**ACTION:** Increases osmolarity of glomerular filtrate, which raises osmotic pressure of fluid in renal tubules; there is a decrease in reabsorption of water, electrolytes; increases in urinary output, sodium, chloride, potassium, calcium, phosphorus, uric acid, urea, magnesium

**USES:** Edema; promote systemic diuresis in cerebral edema, decrease intraocular pressure, improve renal function in acute renal failure, chemical poisoning, urinary bladder irrigation, kidney transplant

**Unlabeled uses:** traumatic brain injury

## CONTRAINDICATIONS

Active intracranial bleeding, hypersensitivity, anuria, severe pulmonary congestion, edema, severe dehydration, progressive heart disease, renal failure, acute MI, aneurysm, stroke

**Precautions:** Pregnancy, breastfeeding, geriatric, dehydration, severe renal disease, HF, electrolyte imbalances

**BLACK BOX WARNING:** Acute bronchospasm, asthma

## DOSAGE AND ROUTES

### Oliguria, prevention in acute renal failure

**Adult: IV** after initial test dose and if urine output is 30-50 mg/hr × 2 hr, give 20-100 g of a 15% or 20% SOL in a 24-hr period

### Oliguria, treatment

**Adult: IV** after initial test dose, give balance of 50 g of a 20% SOL over 1 hr, then 5% via CONT IV INF to maintain output at 50 ml/hr
**Child (unlabeled): IV** 0.5-2 g/kg as a 15%-20% SOL, run over 30-60 min; maintenance 0.25-0.5 g/kg q4-6hr

### Edema

**Adult: IV** after dose, use product 10%-20% at a rate of 25-75 ml/hr, give loop diuretics prior to mannitol
**Child: IV** (unlabeled) 0.5-2 g/kg of 15%-20% mannitol over 2-6 hr

### Intraocular pressure

**Adult: IV** 1.5-2 g/kg of a 15%-20% SOL over 30-60 min

### ICP

**Adult: IV** 1-2 g/kg, then 0.25-1 g/kg q4hr

### Diuresis in product intoxication

**Adult and child >12 yr:** 5%-25% SOL continuously up to 200 g **IV**, while maintaining 100-500 ml urine output/hr

### Kidney transplant

**Adult:** Donor **IV** 12.5 g prior to nephrectomy, with adequate hydration, may repeat
**Recipient:** 50 g prior to revascularization

### Traumatic brain injury (unlabeled)

**Adult: IV** 1.4 g/kg prior to neurosurgery with fluid replacement

**Available forms:** Inj 5%, 10%, 15%, 20%, 25%; GU irrigation 5%; Inhalation cap challenge kit

### Implementation

**Irrigation**
- Use 100 ml of 25%/900 ml of sterile water for inj (2.5% sol)
- Administer potassium replacement if potassium level is <3 mg/ml

**Intermittent/continuous IV route**
- Change IV set q24hr
- May warm solution to dissolve crystals
- Precipitate may occur with PVC
- Use an in-line filter for 15%, 20%, 25%; give with inf pump; check **IV** patency at inf site before, during administration; do not use sol that is yellow or has a precipitate or crystals, use in-line filter, do not give as direct injection; to redissolve, run bottle under hot water and shake vigorously; cool to body temp before giving
- Run at 30-50 ml/hr in oliguria; run over 30-60 min in increased ICP; run over 30 min for intraocular pressure; 60-90 min after surgery
- Monitor for infiltration, potency during use
- Give 20 mEq NaCl/L of product solution if blood is given concurrently
- **Test dose** with severe oliguria, 0.2 g/kg over 3-5 mins; if continued oliguria give 2nd test dose; if no response, reassess patient

**Y-site compatibilities:** Acetaminophen, acyclovir, alemtuzumab, amifostine, amikacin, ampicillin, atropine, asparaginase, aztreonam, bivalirudin, bumetanide, calcium gluconate,

caspofungin, ceFAZolin, cefotaxime, cefOXitin, cefTAZidime, ceftizoxime, chloramphenicol, cimetidine, cisatracurium, clindamycin, DAPTOmycin, dexmedetomidine, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOPamine, DOXOrubicin liposome, doxycycline, enalaprilat, EPINEPHrine, ertapenem, esmolol, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, gentamicin, granisetron, heparin, HYDROmorphone, hydrOXYzine, IDArubicin, imipenem/cilastatin, insulin, isoproterenol, ketorolac, labetalol, levofloxacin, lidocaine, linezolid, LORazepam, meperidine, metoclopramide, metoprolol, metroNIDAZOLE, micafungin, midazolam, milrinone, morphine, nafcillin, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, ondansetron, oxaliplatin, PACLitaxel, palonosetron, pantoprazole, penicillin G potassium, phenylephrine, piperacillin/tazobactam, potassium chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, quinupristin/dalfopristin, ranitidine, remifentanil, sargramostim, sodium bicarbonate, tacrolimus, thiotepa, ticarcillin/clavulanate, tirofiban, tobramycin, trimethoprim/sulfamethoxazole, vancomycin, vasopressin, verapamil, vinCRIStine, vitamin B complex with C, voriconazole, zoledronic acid

**Y-site incompatibilities:** Aminophylline, amphotericin B cholesteryl sulfate complex, calcium chloride, cefepime, cefTRIAXone, cefuroxime, ciprofloxacin, dexamethasone sodium phosphate, diazepam, drotrecogin, haloperidol, lansoprazole, methylPREDNISolone sodium succinate, phenytoin, phytonadione

## ADVERSE EFFECTS

**CNS:** *Dizziness, headache,* seizures, rebound increased ICP, confusion
**CV:** Edema, hypotension, hypertension, tachycardia, HF, thrombophlebitis, angina-like chest pains, fever, chills, circulatory overload, PVCs
**EENT:** Loss of hearing, blurred vision, nasal congestion, decreased intraocular pressure
**ELECT:** Fluid, electrolyte imbalances, acidosis, electrolyte loss, dehydration, hyper/hypokalemia
**GI:** *Nausea, vomiting,* dry mouth, diarrhea
**GU:** Marked diuresis, urinary retention, thirst
**RESP:** Pulmonary congestion, *cough,* dyspnea
**INTEG:** Injection site reaction

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete |
| **Distribution** | Extracellular spaces |
| **Metabolism** | Minimal |
| **Excretion** | Renal |
| **Half-life** | 100 min |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ½-1 hr |
| **Peak** | 1 hr |
| **Duration** | 6-8 hr |

## INTERACTIONS

### Individual drugs

Lithium: increased elimination of mannitol, monitor lithium level
Imipramine: increased excretion of imipramine
Arsenic trioxide, levomethadyl: increased hypokalemia

### Drug classifications

Aminoglycosides, other nephrotic products, avoid concurrent use
Salicylates, barbiturates, bromides: increased excretion of each specific product
Opioids: decreased mannitol effet, increased reactions

### Drug/food

Potassium foods: increased hyperkalemia

### Drug/lab test

Interference: inorganic phosphorus, ethylene glycol
Decrease: ANC
Increase or decrease: sodium, potassium, magnesium

## NURSING CONSIDERATIONS

### Assessment

- Assess neurologic status: LOC, ICP reading, pupil size and reaction when product is given for increased ICP
- Assess for vision changes or eye discomfort or pain before, during treatment (increases intraocular pressure); neurologic checks, ICP during treatment (increased ICP)

**BLACK BOX WARNING: Bronchospasm/asthma:** Test for bronchial hyperresponsiveness should not be performed in any person with asthma or baseline pulmonary function test FEV1<1-1.5L or <70% of predicted values

- Assess patient for tinnitus, hearing loss, ear pain; periodic testing of hearing is needed when high doses of this product are given by **IV** route
- Assess fluid volume status: check I&O ratios and record hourly urine values, breath sounds, weight, distended red veins, crackles in lungs, color, quality, and specific gravity of urine, skin turgor, adequacy of pulses, moist mucous membranes (provide adequate fluids), bilateral lung sounds, peripheral pitting edema

M

• Assess for dehydration; symptoms of decreasing output, thirst, hypotension, dry mouth and mucous membranes should be reported, provide frequent mouth care
• Monitor electrolytes: potassium, sodium, calcium, magnesium; also include BUN, PAP, qday; regularly monitor serum and urine levels of sodium and potassium
• Assess B/P before, during therapy with patient lying, standing, and sitting as appropriate; orthostatic hypotension can occur rapidly
• Monitor for rebound ICP: headache, confusion
• **Beers:** Use with caution in older adults, may cause or exacerbate SIADH
• **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding, excretion unknown

### Patient/family education
• Teach patient reason for and method of treatment, pain at injection site, hearing loss, blurred vision

### Evaluation
**Positive therapeutic outcome**
• Decreased intraocular pressure
• Prevention of hypokalemia (diuretic use)
• Decreased edema
• Decreased ICP
• Increased diuresis of >30 ml/hr
• Increased excretion of toxic substances

## TREATMENT OF OVERDOSE:
Discontinue infusion; correct fluid, electrolyte imbalances; hemodialysis; monitor hydration, CV, renal function

## meclizine (OTC, Rx)
(mek'li-zeen)
**Antivert, Bonine, Dramamine Less Drowsy Formula**
*Func. class.:* Antiemetic, antihistamine, anticholinergic
*Chem. class.:* $H_1$-receptor antagonist, piperazine derivative

**Do not confuse:** Antivert/Axert

**ACTION:** Suppresses vestibular end-organ receptors and inhibits activation of cholinergic pathways

**Therapeutic outcome:** Decreased nausea in motion sickness; decreased vertigo

**USES:** Vertigo, motion sickness

## CONTRAINDICATIONS
Hypersensitivity to cyclizines, shock

**Precautions:** Pregnancy, breastfeeding, children, geriatric, closed-angle glaucoma, glaucoma, prostatic hypertrophy, urinary retention, GI obstruction, contact lenses

## DOSAGE AND ROUTES
### Vertigo
**Adult/adolescent:** PO 25-100 mg/day in divided doses

### Motion sickness
**Adult/adolescent:** PO 25-50 mg 1 hr before traveling; repeat dose q24hr prn

**Available forms:** Tabs 12.5, 25, 50 mg

### Implementation
• May give without regard to food
• **Chew tab:** Give without regard to water or may be swallowed whole with water
• Give lowest possible dose in geriatric, anticholinergic effects

## ADVERSE EFFECTS
**CNS:** *Drowsiness,* fatigue
**CV:** Hypotension
**EENT:** blurred vision
**GI:** Dry mouth

### Pharmacokinetics
| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 6 hr |

### Pharmacodynamics
| | |
|---|---|
| **Onset** | 1 hr |
| **Peak** | Unknown |
| **Duration** | 8-24 hr |

## INTERACTIONS
### Individual drugs
Alcohol: increased effects
Atropine: increased anticholinergic effects

### Drug classifications
Antihistamines, antidepressants, phenothiazines: increased anticholinergic effect
CNS depressants, opioids: increased CNS depression

### Drug/herb
Hops, valerian, kava: increased sedative effect

### Drug/lab test
False negative: allergy skin testing (allergen extracts)

## NURSING CONSIDERATIONS
### Assessment
• **Vertigo/motion sickness:** nausea, vomiting after 1 hr, assess vertigo periodically

- Monitor VS, B/P
- **Assess for signs of toxicity of other products or masking of symptoms of disease:** brain tumor, intestinal obstruction
- Observe for drowsiness, dizziness, LOC
- **Pregnancy/breastfeeding:** Only use if needed, occasional doses should not pose a risk in breastfeeding

### Patient/family education

- Teach patient that a false-negative result may occur with skin testing for allergies; these procedures should not be scheduled for 4 days after discontinuing use
- Advise patient to use sugarless gum, frequent sips of water for dry mouth
- Teach patient to avoid hazardous activities, activities requiring alertness; dizziness may occur; instruct patient to request assistance with ambulation
- Teach patient to avoid alcohol, other depressants, breastfeeding, report severe side effects
- **Motion sickness prophylaxis: Teach patient to take ≥ 1 hr before event that may cause motion sickness**

### Evaluation

**Positive therapeutic outcome**

- Absence of dizziness, vomiting

**⚠ HIGH ALERT**

## medroxyPROGESTERone (Rx)

(me-drox-ee-proe-jess'te-rone)

**Depo-Provera, Depo-subQ Provera, Gen-Medroxy 🍁, Provera**

*Func. class.:* Hormone: progestogen, contraceptive, antineoplastic

*Chem. class.:* Progesterone derivative

**Do not confuse:** medroxyPROGESTERone/methylPREDNISolone, Provera/Premarin/Covera

**ACTION:** Inhibits secretion of pituitary gonadotropins, which prevents follicular maturation and ovulation; antineoplastic action against endometrial cancer

**Therapeutic outcome:** Decreased abnormal uterine bleeding, absence of amenorrhea

**USES:** Uterine bleeding (abnormal), secondary amenorrhea, contraceptive, prevention of endometrial changes associated with estrogen replacement therapy (ERT), inoperable, recurrent, metastatic endometrial/renal cancer

## CONTRAINDICATIONS

Pregnancy, hypersensitivity, reproductive cancer, genital bleeding (abnormal, undiagnosed), missed abortion, stroke, cerebrovascular disease, cervical cancer, hepatic disease, uterine/vaginal cancer

**BLACK BOX WARNING:** Breast cancer, MI, stroke, thromboembolic disease, thrombophlebitis

**Precautions:** Breastfeeding, hypertension, asthma, blood dyscrasias, gallbladder disease, HF, diabetes mellitus, bone disease, depression, migraine headache, seizure disorders, renal/hepatic disease, family history of cancer of breast or reproductive tract, bone mineral density loss, ocular disorders, AIDS/HIV, alcoholism, children, hyperlipidemia, cardiac disease

**BLACK BOX WARNING:** Use of this product has been shown to increase dementia in women ≥65 yr old; use may increase osteoporosis in long-term treatment, those at greater risk also smoke, adequate calcium and vitamin D should be taken

M

## DOSAGE AND ROUTES

### Secondary amenorrhea

**Adult:** PO 5-10 mg/day × 5-10 days, start during any time of the menstrual cycle

### Uterine bleeding

**Adult:** PO 5-10 mg/day × 5-10 days starting on 16th or 21st day of menstrual cycle

### With ERT

**Adult:** PO 5-10 mg qd × 10-14 or more days/mo (sequential estrogen); 2.5-5 mg qd (continuous estrogen)

### Contraceptive

**Adult (women):** IM 150 mg q12wk (Depo-Provera); SUBCUT (depot SUBCUT 104 inj) 104 mg q3mo, give first dose during first 5 days of the menstrual period, only within the first 5 days postpartum (no breastfeeding), only sixth postpartum week (breastfeeding)

### Endometrial/renal cancer inoperable recurrent metastatic

**Adult:** IM 400 mg-1 g (using 400 mg/ml depot inj susp) qwk

### Endometriosis pain

**Adult:** SUBCUT 104 mg q12-14 wk, begin on day 5 of normal menses, avoid use >2 yr

**Available forms:** Tabs 2.5, 5, 10 mg; inj susp 50, 150, 400 mg/ml; 104 mg/0.65 ml

### Implementation

**PO route**

• Give without regard to food

**IM route**

• Visually inspect particulate matter and discoloration prior to use

• Give titrated dose; use lowest effective dose; give oil sol deep in large muscle mass (IM); rotate sites; use after warming to dissolve crystals

**Depo-Provera Contraceptive injection suspension:**

• IM only, NEVER IV, use only 150 mg/ml vial

• Instruct patient on risks and warnings associated with hormonal contraceptives (see Patient Information)

• The possibility of pregnancy should be excluded prior to giving the first dose of medroxyprogesterone or whenever more than 14 weeks have passed since the last dose

• Do not dilute

• Shake vigorously immediately before administration

• Inject deeply into the gluteal or deltoid muscle. Aspirate prior to injection to avoid injection into a blood vessel

**Depo-Provera Sterile Aqueous Suspension, preserved:**

• IM only, NEVER IV

• Instruct patient on risks and warnings associated with progestin use (see Patient Information)

• Shake vigorously immediately before use

• When multidose vials are used, take special care to prevent contamination

• Inject deeply into the gluteal or deltoid muscle. Aspirate prior to injection

**SUBCUT route**

**Depo-subQ Provera 104 Contraceptive Injection Suspension ONLY:**

• For SUBCUT use only; NEVER give IM or IV

• Instruct patient on risks and warnings associated with hormonal contraceptives (see Patient Information)

• Shake vigorously for at least 1 min before use

• Inject the entire contents of the prefilled syringe subcut into the anterior thigh or abdomen, avoiding bony areas and the umbilicus. Gently grasp and squeeze a large area of skin in the chosen injection area, ensuring that the skin is pulled away from the body. Insert the needle at a 45-degree angle. Inject until the syringe is empty; this usually requires 5-7 seconds. Following use, press lightly on the injection site with a clean cotton pad for a few seconds; do not rub the area

## ADVERSE EFFECTS

**CNS:** Dizziness, *headache*, migraine, depression, fatigue, nervousness

**CV:** Thrombophlebitis, edema, thromboembolism, stroke, pulmonary embolism, MI

**EENT:** Diplopia

**GI:** *Nausea, increased weight,* cholestatic jaundice, *abdominal pain*

**GU:** *Amenorrhea*, cervical erosion, breakthrough bleeding, dysmenorrhea, vaginal candidiasis, breast changes, vaginitis, increased/decreased libido

**INTEG:** Acne, hirsutism, alopecia, injection site reaction

**META:** Hyperglycemia

**MS:** Decreased bone density

**SYST:** Angioedema, anaphylaxis, breast cancer

### Pharmacokinetics

Unknown

### Pharmacodynamics

| | PO | IM |
|---|---|---|
| **Onset** | Unknown | Unknown |
| **Peak** | Unknown | Unknown |
| **Duration** | 2-4 hr | Unknown |

## INTERACTIONS

### Individual drugs

Aminoglutethimide, carBAMazepine, phenytoin, PHENobarbital, rifampin: decreased contraceptive effect

### Drug categories

Anticoagulants, corticosteroids: decreased bone mineral density

Strong CYP3A4 inhibitors (clarithromycin, ketoconazole, itraconazole, ritonavir, indinavir, voriconazole:

Increased: medroxyprogesterone

### Drug/lab test

Increased: LFTs, HDL, triglycerides, coagulation tests

Decreased: GTT

### Drug/herb

St. John's wort: Increased menstrual bleeding

## NURSING CONSIDERATIONS

### Assessment

• Assess for symptoms indicating severe allergic reaction, angioedema; have EPINEPHrine and resuscitative equipment available

• Monitor B/P at beginning of treatment and periodically; check weight daily; notify prescriber of weekly weight gain >5 lb; bone mineral density

• Assess liver function tests: ALT, AST, bilirubin, periodically during long-term therapy

**BLACK BOX WARNING:** Use of product shown to increase dementia in women ≥ 65 yr old; use may increase osteoporosis in long-term treatment; those who smoke also at greater risk; adequate calcium and vitamin D should be taken

**BLACK BOX WARNING:** This product should not be given to those with breast cancer, MI, stroke, thromboembolic disorders

- **Bone mineral density loss:** in those taking anticoagulants, corticosteroids with Depo-Provera or Depo-subQ Provera
- **Menstrual history:** Duration of menses, bleeding, spotting, age of menstruation, regularity; start on any day in those with amenorrhea, or day 16 or 21 in dysfunctional bleeding
- Assess mental status: affect, mood, behavioral changes, depression
- **Ectopic pregnancy:** Assess for severe abdominal pain, if patient becomes pregnant, may indicate ectopic pregnancy, which is a medical emergency

### Patient/family education

- Advise patients to avoid sunlight or use sunscreen; photosensitivity and melasma (brown patches on the face) can occur
- Teach patient about cushingoid symptoms: weight gain, moon face, buffalo hump, acne
- Teach women patients to report breast lumps, vaginal bleeding, edema, jaundice, dark urine, clay-colored stools, dyspnea, headache, blurred vision, abdominal pain, sudden changes in speech/coordination, numbness or stiffness in legs, chest pain; teach men to report impotence or gynecomastia
- Teach patient to report suspected pregnancy immediately; fertility returns in 6-12 mo after discontinuing, do not use in pregnancy, breastfeeding

**BLACK BOX WARNING:** Long-term use decreases bone density; exercise, calcium, vitamin D supplements can help lessen osteoporosis

- Advise patient that product doesn't protect against sexually transmitted disease, including HIV
- Advise patient that injection (SUBCUT) must be given every 3 mo for contraception, if dose is missed, pregnancy can occur
- Teach patient how to perform a breast self-exam, that if lumps are detected notify provider immediately
- Teach patient to take with food if nausea occurs
- Teach patient to have complete physical exam with reproductive exam, including mammogram, yearly
- Review package insert with patient, patient must understand all possible reactions

### Evaluation

**Positive therapeutic outcome**

- Decreased abnormal uterine bleeding
- Absence of amenorrhea
- Prevention of pregnancy
- Arrested spread of malignant cells

**⚠ HIGH ALERT**

## megestrol (Rx)

(me-jess'trole)

**Megace, Megace ES, Megase OS** 🍁

*Func. class.:* Antineoplastic hormone

*Chem. class.:* Progestin

**Do not confuse:** Megace/Reglan

**ACTION:** Affects endometrium by antiluteinizing effect; this is thought to bring about cell death, stimulates appetite by unknown action

**Therapeutic outcome:** Prevention of rapidly growing malignant cells; weight gain, increased appetite in AIDS

**USES:** Breast, endometrial cancer; increased weight, decreased cachexia and anorexia associated with AIDS

**Unlabeled uses:** Hot flashes, prostate cancer

### CONTRAINDICATIONS

Pregnancy, hypersensitivity

**Precautions:** Diabetes, thrombosis, adrenal insufficiency

### DOSAGE AND ROUTES

**Endometrial/ovarian carcinoma (palliative)**

**Adult:** PO 40-320 mg/day in divided doses

**Breast carcinoma**

**Adult:** PO 40 mg qid or 160 mg/day

**AIDS (cachexia)**

**Adult:** PO 800 mg/day (oral SUSP) or 625 mg/day (ES)

**Hot flashes (unlabeled)**

**Adult:** PO 20 mg bid

**Available forms:** Tabs 20, 40 mg; oral susp 40, 125 mg/ml

### Implementation
- Administer with meals for GI symptoms
- Oral susp is usually used for AIDS patients; shake well
- Give tablets for carcinoma
- Give without regard to food

## ADVERSE EFFECTS
**CNS:** Mood swings, insomnia, fever, lethargy, depression
**CV:** Thrombophlebitis, thromboembolism, hypertension
**ENDO:** Adrenal insufficiency
**GI:** Nausea, vomiting, *diarrhea*, abdominal cramps, *weight gain*, flatus, indigestion
**GU:** Gynecomastia, fluid retention, hypercalcemia, vaginal bleeding, discharge, *impotence*, decreased libido, menstruation disorders
**INTEG:** Alopecia, *rash*, pruritus, purpura, itching, sweating
**META:** Hyperglycemia
**MISC:** Tumor flare, leukopenia
**RESP:** Dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed; food increases oral sol |
| **Distribution** | Unknown |
| **Metabolism** | Liver, completely |
| **Excretion** | Feces, urine |
| **Half-life** | 13-105 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Several wk to mo |
| **Peak** | Unknown |

## INTERACTIONS
### Individual drugs
Dofetilide: Serious arrhythmias, avoid using concurrently
Indinavir: Decrease effect of indinavir, may need to increase dose

### Drug/lab test
Increased: glucose

## NURSING CONSIDERATIONS
### Assessment
- PSA levels in men (prostate cancer); blood glucose, liver function studies, serum calcium, weight
- Monitor effects of alopecia on body image; discuss feelings about body changes
- Monitor for frequency of stools, characteristics, cramping, acidosis, signs of dehydration (poor skin turgor, decreased urine output, dry skin, restlessness, weakness, rapid respirations)
- In AIDS patients monitor calorie counts, weight, appetite
- **Assess for thrombophlebitis:** Homan's sign, pain, redness, swelling in calf, thigh; notify prescriber immediately if these occur
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding
- **Beers:** Avoid in older adults for an appetite stimulant, minimal effect on weight, increased risk of thrombotic events

### Patient/family education
- Teach patient to report any complaints or side effects to prescriber
- Advise patient that contraceptive measures must be used during and 4 mo after treatment; product is teratogenic:
- Explore with patient the need for wig or a hairpiece for hair loss
- Caution patient to report vaginal bleeding to prescriber
- Review with patient the need to comply with dosage schedule, not to miss or double doses; missed doses may be taken up to 1 hr before next dose
- Teach patient how to recognize signs of fluid retention, thromboembolism and report immediately
- Teach that gynecomastia and alopecia can occur; reversible after discontinuing treatment
- Advise to monitor blood glucose if diabetic

### Evaluation
**Positive therapeutic outcome**
- Decreased spread of malignant cells
- Weight gain, increased appetite in AIDS patients
- Resolved dysfunctional uterine bleeding

**⚠ HIGH ALERT**

## melphalan (Rx)
(mel'fa-lan)
**Alkeran, Evomela**
*Func. class.:* Antineoplastic, alkylating agent
*Chem. class.:* Nitrogen mustard

**Do not confuse:** melphalan/myleran, Alkeran/Alferon/LeuKeran

**ACTION:** Responsible for cross-linking DNA strands leading to cell death; activity is not cell cycle phase specific

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** Multiple myeloma, advanced ovarian cancer

**Unlabeled uses:** Amyloidosis

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity to this product

**Precautions:** Children, radiation therapy, infection, renal disease

**BLACK BOX WARNING:** Bone marrow depression, secondary malignancy, radiation therapy: requires an experienced clinician, bleeding, infection, risk of serious hypersensitivity reactions

## DOSAGE AND ROUTES

### Multiple myeloma (palliative)

**Adult:** PO 6 mg qd × 2-3 wk, or 10 mg qd × 7-10 days, stop for ≤ 4 wk or until WBC/platelets begin to rise, maintenance 2 mg qday then 2 mg/day when WBC >4000 cells/$mm^3$ and platelets >100,000 cells/$mm^3$, adjust daily between 1 and 3 mg/day based on response or 0.15 mg/kg/day × 7 days, then a rest period of ≥ 14 days, maintenance ≤ 0.05 mg/kg/day or 0.25 mg/kg/day × 4 days repeat q4-6 wk

**Adult: IV** INF 16 mg/$m^2$; reduce in renal insufficiency; give over 15-20 min; give at 2-wk intervals × 4 doses, then at 4-wk intervals

### Ovarian carcinoma (palliative)

**Adult:** PO 0.2 mg/kg/day × 5 days repeat q4-5wk depending on blood counts

**Available forms:** Tabs 2 mg; powder for inj 50 mg

### Multiple myeloma conditioning treatment before stem cell transplantation (Evomela only)

**Adult:** IV infusion 100 mg/$m^2$/day over 30 min for 2 days before stem cell transplantation (day 3, day 2; day 0 (transplant); >130% of ideal body weight or renal disease BUN >30 mg/d reduce dose by 50%

### Implementation

- Give fluids **IV** or PO before chemotherapy to hydrate patient
- Give antacid before oral agent; give product after evening meal, before bedtime; provide antiemetic 30-60 min before giving product and prn to prevent vomiting; give antibiotics for prophylaxis of infection
- Give in AM so product can be eliminated before bedtime
- Use a liquid diet: carbonated beverages; gelatin may be added if patient is not nauseated or vomiting

**PO route**

- Give 1 hr before or 2 hr after meals to prevent nausea/vomiting
- Protect from light, store refrigerated

**Intermittent IV INF route**

- Use gloves during administration; if skin exposure occurs, wash immediately with soap and water, use cytotoxic handling procedures

**Evomela**

**Reconstitution:**

- Add 8.6 ml of 0.9% sodium chloride injection to the vial for a final vial concentration of 5 mg/ml
- Negative pressure should be present in the vial; discard any vial that does not have a vacuum present during reconstitution
- **Storage after reconstitution:** Store at room temperature for up to 1 hr or refrigerated up to 24 hr

**IV infusion:**

- Dilute the appropriate dose with 0.9% sodium chloride to a final concentration not to exceed 0.45 mg/ml
- The diluted solution may be stored at room temperature for up to 4 hr (in addition to 1 hr after reconstitution)
- Administer IV over 30 min when used as conditioning treatment before an autologous stem cell transplant or IV over 15 to 20 min when used as palliative treatment in multiple myeloma patients
- Infuse into an injection port or by injecting slowly into a fast-running IV infusion via a central venous line to avoid extravasation

**Alkeran and generic melphalan**

**Reconstitution:**

- Using a 20-gauge or larger needle, rapidly inject 10 ml of the supplied diluent into a 50-mg vial for a final vial concentration of 5 mg/ml
- Immediately shake the vial well until the solution becomes clear and all material is dissolved
- Dilute the reconstituted vial immediately; the solution is unstable
- Do NOT refrigerate the reconstituted vial; a precipitate forms if the solution is stored at 5° C

**IV infusion:**

- Dilute the appropriate dose in 0.9% sodium chloride to a final concentration not to exceed 0.45 mg/ml
- Administer IV over 15 to 20 min; do NOT give over less than 15 min, and complete the infusion within 60 min from vial reconstitution
- The diluted solution is unstable; about 1% of the labeled dose hydrolyzes every 10 min after dilution with sodium chloride
- Infuse through a central line to avoid extravasation

**Y-site compatibilities:** Acyclovir, amikacin, aminophylline, ampicillin, aztreonam, bleomycin, bumetanide, buprenorphine, butorphanol,

calcium gluconate, CARBOplatin, carmustine, cefAZolin, cefepime, cefoperazone, cefotaxime, cefoTEtan, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, cimetidine, CISplatin, clindamycin, cyclophosphamide, cytarabine, dacarbazine, DACTINomycin, DAUNOrubicin, dexamethasone, diphenhydrAMINE, DOXOrubicin, doxycycline, droperidol, enalaprilat, etoposide, famotidine, floxuridine, fluconazole, fludarabine, fluorouracil, furosemide, gallium, ganciclovir, gentamicin, granisetron, haloperidol, heparin, hydrocortisone sodium phosphate, hydromorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, LORazepam, mannitol, mechlorethamine, meperidine, mesna, methylPREDNISolone, metoclopramide, methotrexate, metroNIDAZOLE, miconazole, minocycline, mitoMYcin, mitoXANtrone, morphine, nalbuphine, netilmicin, ondansetron, pentostatin, piperacillin, plicamycin, potassium chloride, prochlorperazine, promethazine, ranitidine, sodium bicarbonate, streptozocin, teniposide, thiotepa, ticarcillin, ticarcillin/clavulanate, tobramycin, trimethoprim/sulfamethoxazole, vancomycin, vinBLAStine, vinCRIStine, vinorelbine, zidovudine

## ADVERSE EFFECTS

**GI:** *Nausea, vomiting, stomatitis*, *diarrhea*, hepatotoxicity, abdominal pain, anorexia, constipation, dyspepsia
**GU:** *Amenorrhea*, hyperuricemia, gonadal suppression
**HEMA:** Thrombocytopenia, neutropenia, leukopenia, anemia
**INTEG:** Pruritus, necrosis, extravasation
**RESP:** Dyspnea, *pneumonitis,* bronchospasm
**SYST:** Anaphylaxis, allergic reaction, secondary malignancies, edema
**CNS:** Fatigue, fever
**META:** *Hypokalemia*, *hypophosphatemia*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Variable; incompletely absorbed |
| **Distribution** | Rapidly distributed, protein binding ≤ 30%-90% |
| **Metabolism** | Bloodstream |
| **Excretion** | Kidneys, unchanged (10%) |
| **Half-life** | 2 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Sargramostim, GM-CSF, filgrastim, G-CSF: avoid administration 24 hr before or 24 hr after this product
Carmustine: increased pulmonary toxicity
CycloSPORINE: increased renal failure risk, monitor renal studies
Nalidixic acid: increased enterocolitis risk
Radiation: increased toxicity

### Drug classifications

Anticoagulants, NSAIDs, salicylates, thrombolytics, platelet inhibitors: increased bleeding risk, avoid concurrent use
Antineoplastics: increased toxicity
Live virus vaccines: increased adverse reactions; decreased antibody reaction, bring up to date before use

### Drug/lab test

Decrease: Hgb, RBC, WBC, platelets
False-positive: direct Coombs test

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Bone marrow suppression:** Monitor full nadir 2-3 wk; CBC, differential, platelet count weekly; notify prescriber; withhold product if WBC is <3000/mm$^3$ or platelet count is <100,000/mm$^3$; notify prescriber; recovery usually occurs in 6 wk, IV product causes more myelosuppression

**BLACK BOX WARNING:** Requires an experienced clinician; product should be used only by clinician knowledgeable in use of chemotherapy

**BLACK BOX WARNING: Infection:** monitor for cold, fever, chills, sore throat

- **Assess for bleeding:** hematuria, guaiac, bruising or petechiae, from mucosa or orifices q8hr; no rectal temp

**BLACK BOX WARNING:** Assess for symptoms indicating severe allergic reaction: rash, pruritus, urticaria, purpuric skin lesions, itching, flushing; assess allergy to chlorambucil; cross-sensitivity may occur

- **Pregnancy/breastfeeding:** Do not use in pregnancy/breastfeeding
- **Secondary malignancy:** May cause acute leukemia, myeloproliferative syndrome, may occur due to chromosomal change, risk in long-term use

### Patient/family education

- Teach patient to avoid use of products containing aspirin or ibuprofen, nausea/vomiting, dehydration, decreased urine output; to report symptoms of bleeding (hematuria, tarry stools)
- Instruct patient to report signs of anemia (fatigue, headache, irritability, faintness, shortness of breath)

• Instruct patient to report any changes in breathing or coughing even several mo after treatment; to avoid crowds and persons with respiratory tract or other infections
• Tell patient hair loss is common; discuss the use of wigs or hairpieces
• Caution patient not to have any vaccinations without the advice of the prescriber, serious reactions can occur
• Advise patient to report suspected pregnancy, that contraception is needed during treatment and for several mo after the completion of therapy
• Teach patient to rinse mouth tid-qid with water, club soda; brush teeth bid-qid with soft brush or cotton-tipped applicators for stomatitis, use unwaxed dental floss

### Evaluation

**Positive therapeutic outcome**
• Decreased size of tumor
• Decreased spread of malignancy
• **Hepatotoxicity:** Teach patient to report immediately yellowing of skin, eyes, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea

## memantine (Rx)

(me-man'teen)
**Ebixa, Namenda, Namenda XR**
*Func. class.:* Anti–Alzheimer's disease agent
*Chem. class.:* N-methyl-D-aspartate receptor antagonist

**ACTION:** Antagonist action of CNS NMDA receptors that may contribute to the symptoms of Alzheimer's disease

**Therapeutic outcome:** Improved mood, orientation, decreasing confusion

**USES:** Moderate to severe dementia in Alzheimer's disease

**Unlabeled uses:** Vascular dementia

## CONTRAINDICATIONS

Hypersensitivity, children

**Precautions:** Pregnancy, breastfeeding, renal disease, seizures, severe hepatic disease, GU conditions that raise urine pH, renal failure

## DOSAGE AND ROUTES

### Moderate-severe Alzheimer's disease

**Adult:** PO 5 mg/day, may increase dose in 5-mg increments ≥1-wk intervals over a 3-wk period; recommended target dose as 10 mg bid at week 4; ext rel 7 mg/day, increased by 7 mg ≥1 wk up to target dose of 28 mg/day

### Renal dose

**Adult:** PO CCR 5-29 ml/min, a target of 5 mg bid immediate release or 14 mg/day extended release

**Available forms:** Tabs 5, 10 mg; tab titration pak 5, 10 mg; oral sol 2 mg/ml, 10 mg/5 ml; cap ext rel 7, 14, 21, 28 mg

### Implementation

• Can be taken without regard to meals
• Give twice a day if dose >5 mg
• Dosage is adjusted to response no more than q1wk
• Provide assistance with ambulation during beginning therapy; dizziness may occur
• **Extended Release Caps:** Do not crush, chew, divide; swallow whole or open and sprinkle on applesauce
• When switching from immediate release product begin the ext rel the day after the last dose of immediate release product. Those on 10 mg bid should be switched to ext rel 28 mg q day

## ADVERSE EFFECTS

**CNS:** *Dizziness, confusion,* somnolence, headache, hallucinations, stroke
**CV:** Hypertension, heart failure, HF
**GI:** Vomiting, constipation
**INTEG:** Rash
**MISC:** Back pain, fatigue, pain, influenzalike symptoms
**RESP:** Coughing, dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed PO |
| **Distribution** | 44% protein binding |
| **Metabolism** | Very little |
| **Excretion** | 57%-82% excreted unchanged in urine |
| **Half-life** | Half-life 60-80 hr |

### Pharmacodynamics

| | |
|---|---|
| **Peak** | 3-7 hr (tab)<br>9-12 hr (caps) |

## INTERACTIONS

### Individual drugs

Cimetidine, hydrochlorothiazide, nicotine, quiNIDine, ranitidine, triamterene: increased/decreased levels of both products, monitor for adverse reactions
Ergot, levodopa: increased effect of each, monitor for adverse reactions

### Drug classifications

Drugs that make the urine alkaline (sodium bicarbonate, carbonic anhydrase inhibitors): decreased clearance

Use cautiously with amantadine, dextromethorphan, ketamine: reaction unknown

### Drug/lab test
Increase: alkaline phosphatase
**Decrease:** HCT

## NURSING CONSIDERATIONS
### Assessment
- Alzheimer's dementia: affect, mood, behavioral changes; hallucinations, confusion, attention, orientation, memory; monitor serum creatinine
- **Renal disease:** Monitor BUN, creatinine, CCr<30 ml/min, dosage adjustment may be needed
- **Pregnancy/breastfeeding:** Avoid use in pregnancy, breastfeeding

### Patient/family education
- Advise to report side effects: restlessness, psychosis, visual hallucinations, stupor, loss of consciousness; indicate overdose
- Advise patient to avoid alcohol, nicotine
- Advise to use product exactly as prescribed; product is not a cure
- Teach patient to avoid OTC, herbal products unless approved by prescriber
- Teach patient that product doesn't cure Alzheimer's disease, but controls symptoms
- **Adverse reactions:** Patient may not be able to verbalize reactions

### Evaluation
**Positive therapeutic outcome**
- Decrease in confusion, improved mood or ability to maintain function, even with no improvement in symptoms

**⚠ HIGH ALERT**

## meperidine (Rx)
(me-per'i-deen)
**Demerol, Meperitab**
*Func. class.:* Opioid analgesic
*Chem. class.:* Phenylpiperidine derivative
**Controlled substance schedule II**

**Do not confuse:** meperidine/HYDROmorphone/meprobamate/morphine, Demerol/Dilaudid

**ACTION:** Depresses pain impulse transmission at the spinal cord level by interacting with opioid receptors

**Therapeutic outcome:** Relief of pain

**USES:** Moderate to severe pain, preoperatively, postoperatively, general anesthesia maintenance, sedation induction

## CONTRAINDICATIONS
Hypersensitivity, severe respiratory insufficiency, GI obstruction, ileus

**Precautions:** Pregnancy, breastfeeding, children, geriatric, addictive personality, increased ICP, respiratory depression, renal/hepatic disease, seizure disorder, abrupt discontinuation, chronic pain, cardiac disease, adrenal insufficiency, alcoholism, angina, anticoagulant therapy, asthma, atrial flutter, biliary tract disease, bladder obstruction, cardiac dysrhythmias, COPD, CNS depression, coagulopathy, constipation, cor pulmonale, dehydration, diarrhea, driving epidural use, geriatrics, GI obstruction, head trauma, heart failure, hypotension, hypothyroidism, ileus, IBS, IM/intrathecal/IV use, labor, myxedema/thrombocytopenia, MAOI therapy

**BLACK BOX WARNING:** Coadministration with other CNS depressants, respiratory depression

## DOSAGE AND ROUTES
### Moderate to severe pain
**Adult:** PO/SUBCUT/IM 50-150 mg q3-4hr prn
**Child:** PO/SUBCUT/IM 1-1.8 mg/kg q3-4hr prn, max single dose 150 mg

### Preoperative analgesia
**Adult:** IM/SUBCUT 50-100 mg 30-90 min before surgery
**Child:** IM/SUBCUT 1-2 mg/kg 30-90 min before surgery, max 100 mg

### Coadministration with other CNS depressants
**Adult:** PO/IM/SUBCUT/IV Reduce dose by 25%-50%

### Renal dose
**Adult:** PO/SUBCUT/IM/IV, CCr 10-50 ml/min give 75% of dose; CCr <10 ml/min give 25%-50% of dose

### Labor analgesia
**Adult:** SUBCUT/IM 50-100 mg given when contractions are regularly spaced, repeat q1-3hr prn

**Available forms:** Inj 10, 25, 50, 75, 100 mg/ml; tabs 50, 100 mg; syr 50 mg/5 ml

### Implementation
- Doses that are given regularly before pain returns are more effective
- Give with antiemetic if nausea, vomiting occur
- Administer when pain is beginning to return; determine dosage interval by patient response; continuous dosing of medication is more effective given prn
- Medication should be slowly withdrawn after long-term use to prevent withdrawal symptoms

• Store in light-resistant container at room temperature

**PO route**

• May be given with food or milk to lessen GI upset
• Syr should be mixed with 4 oz of water
• Do not use in severe respiratory insufficiency (PO)
• **Oral liquid:** dilute in 4 oz water

**IM/SUBCUT route**

• Do not give if cloudy or a precipitate has formed
• Patient should remain recumbent for 1 hr after administration
• Inject IM into a large muscle mass; IM is preferred route for multiple injections

**Direct IV route**

• Give after diluting to 10 mg/ml or less with sterile water, 0.9% NaCl for inj; give slowly at ≤25 mg/min, over at least 5 min; rapid administration may cause respiratory depression, hypotension, circulatory collapse
• Have emergency equipment and opiate antagonist on hand

**Intermittent IV infusion route**

• Give after diluting to 1 mg/ml with $D_5W$, $D_{10}W$, dextrose/saline combinations, dextrose/Ringer's, inj combinations, 0.45% NaCl, 0.9% NaCl, Ringer's, LR; give by inf pump; titrate according to response

**Y-site compatibilities:** Abelcet, acetaminophen, amifostine, amikacin, anidulafungin, atenolol, aztreonam, bumetanide, cefamandole, cefAZolin, cefmetazole, cefotaxime, cefOXitin, cefoperazone, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, cladribine, clindamycin, diltiazem, diphenhydrAMINE, DOBUTamine, DOPamine, doxycycline, droperidol, erythromycin lactobionate, famotidine, filgrastim, fluconazole, fludarabine, gallium, gentamicin, granisetron, hydrocortisone, IDArubicin, regular insulin, imipenem/cilastatin, kanamycin, labetalol, lidocaine, melphalan, methyldopate, metoclopramide, metoprolol, metroNIDAZOLE, mezlocillin, minocycline ondansetron, oxytocin, PACLitaxel, penicillin G potassium, piperacillin, potassium chloride, propofol, propranolol, ranitidine, sargramostim, teniposide, thiotepa, ticarcillin, ticarcillin/clavulanate, tobramycin, vancomycin, verapamil, vinorelbine

**Continuous intrathecal infusion route**

• Use controlled-infusion device, an implantable controlled-microinfusion device is used for highly concentrated infusion, monitor for several days after implantation
• Infusion reservoir should only be filled by those fully qualified
• To prevent pain, depletion of reservoir should be avoided

## ADVERSE EFFECTS

**CNS:** Drowsiness, dizziness, confusion, headache, sedation, euphoria, increased ICP, seizures, serotonin syndrome
**CV:** Palpitations, bradycardia, hypotension, change in B/P, tachycardia (IV)
**EENT:** Tinnitus, blurred vision, miosis, diplopia, depressed corneal reflex
**GI:** Nausea, vomiting, anorexia, constipation, cramps, biliary spasm, paralytic ileus
**GU:** Urinary retention, dysuria
**INTEG:** Rash, urticaria, bruising, flushing, diaphoresis, pruritus
**RESP:** Respiratory depression
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (IM, SUBCUT); 50% (PO) |
| **Distribution** | Widely distributed; crosses placenta; protein binding 65%-75%; toxic by-product accumulation can result from regular use or in renal disease |
| **Metabolism** | Liver, extensively to active/inactive metabolites |
| **Excretion** | Kidneys; breast milk |
| **Half-life** | 3-4 hr |

### Pharmacodynamics

| | PO | IM/SUBCUT | IV |
|---|---|---|---|
| **Onset** | 15 min | 10 min | immediate, peak 5-7 min |
| **Peak** | | ½-1 hr | 5-7 min |
| **Duration** | 2-4 hr | 2-4 hr | 2 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased respiratory depression, hypotension, sedation
Phenytoin: decreased meperidine effect
Procarbazine: fatal reaction, do not use together within 14 days

### Drug classifications

CNS depressants, opioids, sedative/hypnotics, antipsychotics, skeletal muscle relaxants: increased effects
SSRIs, SNRIs, serotonin-receptor agonists: increased serotonin syndrome, increased neuroleptic malignant syndrome

MAOIs: do not use for 2 wk before taking meperidine; may cause fatal reaction
Protease inhibitor antiretrovirals: increased adverse reactions

### Drug/herb

Kava, hawthorn, lavender, valerian: Increased sedation
St. John's wort: increased CNS depression

### Drug/lab test

Increased: amylase, lipase

## NURSING CONSIDERATIONS

### Assessment

- **Assess pain:** location, duration, intensity before and 1 hr (IM, SUBCUT, PO), 5-10 min (**IV**) after administration
- **Sex hormone change:** Assess for libido, changes in menstrual cycle, erectile dysfunction, infertility, if suspected, obtain androgen levels
- **Adrenal insufficiency:** Assess for anorexia, nausea, vomiting, decreased B/P, weakness; if suspected, obtain cortisol, sodium, potassium levels; if present do not abruptly withdraw, taper
- **Abrupt discontinuation:** Withdraw slowly, if stopped abruptly, assess for withdrawal
- Monitor BUN, serum creatinine
- **Opioids/benzodiazepine:** Use only if alternative products cannot be used, excessive sedation and death may occur
- Monitor B/P, pulse, respirations baseline and during use
- Assess renal function before initiating therapy; poor renal function can lead to accumulation of toxic metabolite and seizures
- **Serotonin syndrome:** When given with SSRI, SNRIs, and serotonin receptor agonists; monitor for hyperthermia, hypertension, rigidity, delirium, coma, symptoms may occur rapidly after a long period
- **Monitor VS after parenteral route; note muscle rigidity, product history, liver, kidney function tests, respiratory dysfunction:** respiratory depression, character, rate, rhythm; notify prescriber if respirations are <12/min, dose may need to be reduced by 25% or more
- Monitor CNS changes: dizziness, drowsiness, hallucinations, euphoria, LOC, pupil reaction; these are due to metabolite produced; CNS stimulation occurs with chronic or high doses, risk of toxicity increases with >600 mg/days
- Monitor allergic reactions: rash, urticaria
- **Bowel function:** Assess for constipation; increase fluids, bulk in diet; give stimulant laxatives if needed
- Pregnancy: Do not use in pregnancy until use in labor, do not breastfeed
- **Beers:** Avoid in older adults especially in those with chronic disease, may cause neurotoxicity, monitor for delirium frequently
- **Children:** Monitor for restlessness, changes in respirations may occur more frequently than in adult
- **Serotonin syndrome:** Report symptoms immediately
- Teach patient not to be used long term

### Patient/family education

- Advise patients to avoid CNS depressants (alcohol, sedative/hypnotics) for at least 24 hr after taking this product
- Discuss with patient that dizziness, drowsiness, and confusion are common; to avoid getting up without assistance
- Discuss in detail with patient all aspects of the product, including its purpose and what to expect
- Caution patient to make position changes carefully to lessen orthostatic hypotension

### Evaluation

**Positive therapeutic outcome**

- Decreased pain

## TREATMENT OF OVERDOSE:

Naloxone 0.2-0.8 mg **IV** (caution in physically dependent patients), $O_2$, **IV** fluids, vasopressors

## meropenem (Rx)

(mer-oh-pen'em)
**Merrem IV**
*Func. class.:* Antiinfective—miscellaneous

**ACTION:** Interferes with cell wall replication of susceptible organisms

**Therapeutic outcome:** Bactericidal action against the following: *Streptococcus pneumoniae,* group A β-hemolytic streptococci, *viridans* group streptococci, enterococcus; gram-negative organisms *Klebsiella, Proteus, Escherichia coli, Pseudomonas aeruginosa, Bacteroides fragilis, Bacteroides thetaiotaomicron,* bacterial meningitis (>3 mo old)

**USES:** *Acinetobacter, Aeromonas hydrophila, Bacteroides distasonis, Bacteroides fragilis, Bacteroides ovatus, Bacteroides thetaiotaomicron, Bacteroides uniformis, Bacteroides ureolyticus, Bacteroides vulgatus, Campylobacter jejuni, Citrobacter diversus, Citrobacter freundii, Clostridium difficile, Clostridium perfringens, Enterobacter cloacae, Enterococcus faecalis, Escherichia coli, Eubacterium lentum, Fusobacterium, Haemophilus influenzae* (beta-lactamase negative), *Haemophilus*

*influenzae* (beta-lactamase positive), *Hafnia alvei, Klebsiella oxytoca, Klebsiella pneumoniae, Moraxella catarrhalis, Morganella morganii, Neisseria meningitidis, Pasteurella multocida, Peptostreptococcus, Porphyromonas asaccharolytica, Prevotella bivia, Prevotella intermedia, Prevotella melaninogenica, Propionibacterium acnes, Proteus mirabilis, Proteus vulgaris, Pseudomonas aeruginosa, Salmonella, Serratia marcescens, Shigella, Staphylococcus aureus* (MSSA), *Staphylococcus epidermidis, Streptococcus agalactiae* (group B streptococci), *Streptococcus pneumoniae, Streptococcus pyogenes* (group A beta-hemolytic streptococci), *Viridans streptococci, Yersinia enterocolitica*; appendicitis, bacteremia, intraabdominal infections, meningitis, peritonitis, skin/skin structure infections

## CONTRAINDICATIONS

Hypersensitivity to meropenem, carbapenems: hypersensitivity to cephalosporins, penicillins

**Precautions:** Pregnancy, breastfeeding, geriatric, renal disease, seizure disorder, gram-negative infection, pneumonia, hypersensitivity to pneumonia

## DOSAGE AND ROUTES

### Intraabdominal infections (complicated appendicitis, peritonitis)

**Adult/adolescent/child >50 kg: IV** 1 g q8hr or 500 mg q6hr

**Adolescent/child ≤50 kg/infant ≥3 mo: IV** 20 mg/kg q8hr

### Complicated skin and skin structure infections

**Adult/adolescent/child >50 kg: IV** 500 mg q8hr

**Adolescent/child ≤50 kg/infant ≥3 mo: IV** 10 mg/kg q8hr

### Bacterial meningitis

**Adult: IV** 2 g q8hr

**Adolescent/child ≤50 kg/infant: IV** 40 mg/kg q8hr

### Renal dose

**Adult:** IV CCr 26-50 ml/min give dose q12hr; CCr 10-25 ml/min give ½ dose q12hr; CCr <10 ml/min give ½ dose q24hr

**Available forms:** Powder for inj 500 mg, 1 g

### Implementation

**Direct IV route**

- Monitor injection site for redness, inflammation, phlebitis periodically
- Reconstitute 500 mg or 1 g vials with 10, 20 ml of sterile water for inj respectively, shake to dissolve and let stand until clear (average conc 50 mg/ml) reconstituted sol may be stored for 3 hr at room temperature or 13 hr refrigerated, inject up to 1 g in 5-20 ml over 3-5 min

**Intermittent IV infusion route**

- Vials may be directly constituted with compatible inf fluid (NS, $D_5W$) to 2.5-50 mg/ml vials; vials with 0.9% NaCl can be stored up to 2 hr at room temperature, or 18 hr refrigerated, $D_5W$ may be stored up to 1 hr at room temperature or up to 15 hr refrigerated, infuse over 15-30 min

**Continuous IV infusion route (unlabeled)**

- **3 g/day continuous IV infusion:** Constitute a 1 g vial according to manufacturer's recommendations; further dilute in 50 ml or 250 ml of NS and run over 8 hr for cont inf, administer a new infusion bag q8hr
- **4 g/day continuous IV infusion:** Constitute a 1 g vial according to manufacturer recommendations. Further dilute in 100 ml of NS and administer over 6 hr. For cont inf, administer a new infusion bag q6hr
- **3 g/day IV continuous infusion in ambulatory infusion pump with freezer packs:** Reconstitute 1 g vial according to manufacturer recommendations by adding 20 ml of NS into each vial. Add 3 g (60 ml) to a 100-ml medication cassette reservoir and bring the final volume to 100 ml (final concentration, 30 mg/ml) run over 24 hr

**Y-site compatibilities:** Alemtuzumab, aminocaproic acid, aminophylline, anidulafungin, argatroban, atenolol, atropine, azithromycin, bivalirudin, bleomycin, CARBOplatin, carmustine, caspofungin, cimetidine, CISplatin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, dexrazoxane, digoxin, diltiazem, diphenhydrAMINE, DOCEtaxel, doxacurium, DOXOrubicin liposomal, enalaprilat, eptifibatide, etoposide, etoposide phosphate, fluconazole, fludarabine, fluorouracil, foscarnet, furosemide, gallium, gatifloxacin, gemcitabine, gemtuzumab, gentamicin, granisetron, heparin sodium, HYDROmorphone, ifosfamide, insulin (regular), irinotecan, lepirudin, leucovorin, linezolid injection, LORazepam, mechlorethamine, methotrexate, metoclopramide, metroNIDAZOLE, milrinone, mitoXANtrone, morphine, nesiritide, norepinephrine, octreotide, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, PEMEtrexed, PHENobarbital, potassium acetate/chloride, rocuronium, teniposide, thiotepa, tigecycline, tirofiban, TNA (3-in-1) Total Nutrient Admixture, vancomycin, vasopressin, vecuronium, vinBLAStine, vinCRISTine, vinorelbine, voriconazole, zoledronic acid

## ADVERSE EFFECTS

**CNS:** Fever, somnolence, *seizures,* dizziness, *headache,* myoclonia, confusion
**CV:** Hypotension, tachycardia
**ENDO:** Hypoglycemia
**GI:** Diarrhea, nausea, vomiting, pseudomembranous colitis, hepatitis, glossitis, jaundice
**HEMA:** Eosinophilia, neutropenia, decreased Hgb, Hct, agranulocytosis
**INTEG:** *Rash,* urticaria, *pruritus,* pain at inj site, phlebitis, erythema at inj site
**RESP:** Chest discomfort, apnea, pneumonia, pulmonary embolism
**SYST:** Anaphylaxis, Stevens-Johnson syndrome, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete bioavailability |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | 1 hr; increased in renal disease |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | Dose dependent |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Probenecid: increased meropenem levels, avoid concurrent use
Valproic acid: decreased effect of valproic acid, monitor for seizures

### Drug/herb

Do not use acidophilus with antiinfectives; separate by several hours

### Drug/lab test

Increased: AST, ALT, LDH, BUN, alkaline phosphatase, bilirubin, creatinine
Increase or decrease: INR, platelets, PT, PTT
False positive: direct Coombs' test, urine glucose

## NURSING CONSIDERATIONS

### Assessment

- **Infection:** Appearance of wound, urine, sputum, temperature, WBC
- Assess patient for previous sensitivity reaction to carbapenem antiinfectives, penicillins, cephalosporins, before starting this product
- **Assess patient for signs and symptoms of infection,** including characteristics of wounds, sputum, urine, stool, WBC >10,000/100 $mm^3$, fever; obtain baseline information before, during treatment
- Complete C&S tests before beginning product therapy to identify if correct treatment has been initiated
- **Seizures:** may occur in those with brain lesions, seizure disorder, bacterial meningitis, or renal disease; stop product, notify prescriber if seizures occur, seizure threshold is lowered, if seizures occur, stop product, notify provider
- **Assess for allergic reactions, anaphylaxis:** rash, urticaria, pruritus, chills, fever, joint pain; angioedema may occur a few days after therapy begins; EPINEPHrine and resuscitation equipment should be available for anaphylactic reaction; identify if there has been hypersensitivity to penicillins, cephalosporins, beta-lactams: cross-sensitivity may occur, have emergency equipment nearby
- Identify urine output; if decreasing, notify prescriber (may indicate nephrotoxicity); also check for increased BUN, creatinine
- Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test monthly if patient is on long-term therapy
- Monitor electrolytes: potassium, sodium, chloride monthly if patient is on long-term therapy
- Assess bowel pattern daily; if severe diarrhea occurs, product should be discontinued; may indicate pseudomembranous colitis
- Monitor for bleeding: ecchymosis, bleeding gums, hematuria, stool guaiac daily if on long-term therapy
- **Assess for overgrowth of infection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum
- **Pregnancy/breastfeeding:** Use only if clearly needed, no well-controlled studies, use cautiously in breastfeeding, excreted in breast milk

### Patient/family education

- Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
- Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate superinfection; seizures
- Advise patient to avoid breastfeeding; product is excreted in breast milk
- Advise patient to notify prescriber of diarrhea with blood or pus; may indicate pseudomembranous colitis

### Evaluation

**Positive therapeutic outcome**

- Absence of signs/symptoms of infection (WBC <10,000/$mm^3$, temp WNL, absence of red draining wounds)
- Reported improvement in symptoms of infection

**TREATMENT OF ANAPHYLAXIS:** EPINEPHrine, antihistamines, resuscitate if needed

## mesalamine, 5-ASA (Rx)

(mez-al′a-meen)

**Apriso, Asacol, Asacol HD, Canasa, Delzicol, Lialda, Mesasal, Mezavant, Pentasa, Rowasa, SF Rouasa Salofalk**

*Func class.:* GI antiinflammatory

*Chem. class.:* 5-Aminosalicylic acid

**Do not confuse:** Asacol/Ansaid/Os-Cal

**ACTION:** May diminish inflammation by blocking cyclooxygenase, inhibiting prostaglandin production in colon, local action only

**Therapeutic outcome:** Decreased cramping, pain in GI conditions

**USES:** Mild to moderate active distal ulcerative colitis, proctitis

**Unlabeled uses:** Crohn's disease

## CONTRAINDICATIONS

Hypersensitivity to this product or salicylates, 5-aminosalicylates

**Precautions:** Pregnancy, breastfeeding, children, geriatric, renal disease, sulfite sensitivity, pyloric stenosis, GI obstruction

## DOSAGE AND ROUTES

### Treatment of ulcerative colitis

**Adult:** RECT 60 ml (4 g) at bedtime, retained for 8 hr × 3-6 wk; del rel tab (Lialda) 2.4-4.8 g/day × 8 wk; del rel tab (Asacol) 1.6 g × 6 wk; cont rel cap (Pentasa) 1 g qid up to 8 wk; RECT SUPP 500 mg bid retained for 1-3 hr × 3-6 wk until remission, may increase to tid if needed; del rel cap (Delzicol) 800 mg tid ×6 wk

### Maintenance of remission

**Adult:** PO (delayed release tabs: Asacol) 800 mg bid or 400 mg qid; (delayed release caps: Apriso) 1500 mg (4 caps) each AM; (delayed release tabs: Lialda) 2.4 g (2 tab)/day with a meal; del rel cap (Delzicol) 800 mg bid

**Available forms:** Rectal Susp 4 g/60 ml (Rowasa, ss Rowasa); del rel tabs 400 mg (Asacol); 800 mg (Asacol HD); ext rel tab 500 mg; ext rel cap 250 mg, 500 mg (Pentasa); del rel tab (Lialda) 1.2 g; 0.375 g (Apriso); rect supp 1000 mg; del rel cap (Delzicol) 400 mg; enema suspension 4 g/60 ml (sfRowasa)

### Implementation

**PO route**

- Do not break, crush, or chew del rel tabs
- **Lialda:** take with a meal
- **Apriso caps:** without regard to meals in AM
- **Delzicol caps:** give ≥1 hr before a meal or 2 hr after a meal

**Rectal route (susp)**

- Give at bedtime, retained until AM; empty bowel before insertion
- Store at room temperature
- Usual course of therapy is 3-6 wk
- Give after shaking bottle well

## ADVERSE EFFECTS

**CNS:** *Headache, fever, dizziness,* insomnia, asthenia, weakness, fatigue

**CV:** Chest pain, palpitations

**EENT:** Sore throat, cough, pharyngitis, rhinitis

**GI:** *Cramps, gas, nausea, diarrhea,* rectal pain, constipation, vomiting

**GU:** Nephrotoxicity, interstitial nephritis

**INTEG:** *Rash, itching,* acne

**SYST:** *Flulike symptoms, malaise,* back pain, peripheral edema, leg and joint pain, arthralgia, dysmenorrhea, anaphylaxis, acute intolerance syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 20%-30% (PO), 10%-25% (RECT) |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Feces |
| **Half-life** | 1 hr; metabolite 5-10 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Azathioprine, mercaptopurine: increased action of each product

Lactulose: decreased mesalamine absorption

Omeprazole: increased mesalamine absorption

Warfarin: decreased effect of warfarin

### Drug classifications

$H_2$ blockers: do not give with Apriso

NSAIDs: increased nephrotoxicity

Antacids: decreased mesalamine absorption

### Drug/lab test

Increased: AST, ALT, alkaline phosphatase, LDH, GGTP, amylase, lipase

## NURSING CONSIDERATIONS

### Assessment

- Assess for GI symptoms: cramping, gas, nausea, diarrhea, rectal pain, abdominal pain; if severe, the product should be discontinued
- Assess for allergy to salicylates, sulfonamides, sulfites; if allergic reactions occur, discontinue product
- Assess renal function before, during treatment: BUN, creatinine periodically; increase fluids to maintain urine at ≥ 1200 ml/day to prevent crystalluria
- **Pregnancy/breastfeeding:** Avoid in pregnancy, breastfeeding, excreted in breast milk

### Patient/family education

- Teach patient that usual, initial course of therapy is 3-6 wk; to notify provider if symptoms do not improve after 2 mo of treatment, to continue to take even if feeling better, do not miss or take double doses, if a dose is missed take when remembered, if almost time for next dose skip it
- Advise patient to notify prescriber if abdominal pain, cramping, diarrhea with blood, headache, fever, rash, chest pain occur; product should be discontinued, rash, bruising, bleeding, fever, mouth sores
- Teach correct administration for PO or enema, to notify provider if symptoms do not improve after 2 mo of treatment

### Evaluation

**Positive therapeutic outcome**

- Absence of pain, bleeding from GI tract

**⚠ HIGH ALERT**

## metFORMIN (Rx)

(met-for′min)

**Fortamet, Glucophage, Glucophage XR, Glumetza, Glycon, Riomet**

*Func. class.:* Antidiabetic, oral

*Chem. class.:* Biguanide

**Do not confuse:** metFORMIN/metroNIDAZOLE, Glucophage/Glucovance/Glucotrol

**ACTION:** Inhibits hepatic glucose production and increases sensitivity of peripheral tissue to insulin

**Therapeutic outcome:** Blood glucose at normal levels

**USES:** Type 2 diabetes mellitus

## CONTRAINDICATIONS

Creatinine ≥1.5 mg/ml (males); diabetic ketoacidosis, metabolic acidosis, renal failure, radiographic contrast use

**Precautions:** Pregnancy, breastfeeding, geriatric, thyroid disease, previous HF, hypersensitivity; hepatic disease; alcoholism; cardiopulmonary disease; acidemia; acute MI; cardiogenic shock; renal disease, heart failure

**BLACK BOX WARNING:** Lactic acidosis

## DOSAGE AND ROUTES

### Type 2 diabetes mellitus

**Adult:** PO 500 mg bid or 850 mg/day initially, then 500 mg weekly or 850 mg q2wk up to 2000 mg/day in divided doses; dosage adjustment q2-3wk or 850 mg/day with morning meal with dosage increased every other week, max 2550 mg/day; ext rel (Glucophage XR) 500 mg qd with evening meal; may increase by 500 mg qwk, max 2000 mg/day; (Glumetza) 1000 mg qd with food, preferably with the PM meal, may increase by 500 mg qwk, max 2000 mg/day; (Fortamet) 500-1000 mg qd with PM meal, may increase by 500 mg qwk, max 2550 mg/day

### Renal dose

**Adult:** PO eGFR 30-45 ml/min/1.73 $m^2$ avoid use, if >45 ml/min/1.73 $m^2$ then falls <45 ml/min/1.73 $m^2$ assess benefits/risks of treatment; discontinue if falls <30 ml/min/1.73$m^2$

**Geriatric:** PO use lowest effective dose

**Available forms:** Tabs 500, 850, 1000 mg; ext rel tabs 500, 750, 850, 1000 mg; oral sol (Riomet) 500 mg/5 ml

### Implementation

- Monitor eGFR at least annually
- Do not use in dialysis
- Conversion from other oral hypoglycemic agents; change may be made without gradual dosage change; monitor serum or urine glucose and ketones tid during conversion
- **Immediate rel:** give twice a day with meals to decrease GI upset and provide best absorption
- Give immediate rel tabs crushed and mixed with meal or fluids for patients with difficulty swallowing
- **Extended release product:** may also be taken as a single dose; titrate slowly to therapeutic response, side-effect tolerance
- Do not break, crush, or chew ext rel tabs
- May be given with evening meal
- Store in tight container in cool environment
- **Oral solution:** Use calibrated spoon, oral syringe, or container to measure, give with meals

## ADVERSE EFFECTS

**CNS:** *Headache, weakness, dizziness, drowsiness,* tinnitus, fatigue, vertigo, *agitation*

**CV:** Heart failure

**ENDO:** Lactic acidosis, hypoglycemia

**GI:** Nausea, vomiting, diarrhea, heartburn, anorexia, metallic taste
**HEMA:** Thrombocytopenia, decreased vit $B_{12}$ levels
**INTEG:** Rash

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys, unchanged (35%-50%) |
| **Half-life** | 1½-6 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-2 hr (immediate rel); 7 hr (ext rel); 2.5 hr (sol) |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Cimetidine, digoxin, morphine, procainamide, quiNIDine, ranitidine, triamterene, vancomycin: increased metFORMIN level, monitor blood glucose
β-blockers, phenytoin: increased hyperglycemia
Digoxin: increased digoxin levels, monitor digoxin levels
Dofetilide: increased lactic acidosis, do not use together
Radiologic contrast media: do not give together; may cause renal failure

### Drug classifications

Calcium channel blockers, contraceptives (oral), corticosteroids, diuretics, estrogens, phenothiazines, sympathomimetics: increased hypoglycemia, monitor blood glucose

### Drug/herb

Garlic, green tea: increased hypoglycemia
Glucosamine: increased hyperglycemia

### Drug/lab test

Decreased: Vitamin $B_{12}$

## NURSING CONSIDERATIONS

### Assessment

- Assess for hypoglycemic reactions (sweating, weakness, dizziness, anxiety, tremors, hunger), hyperglycemic reactions soon after meals; these occur rarely with this product
- Monitor CBC (baseline, q3mo) during treatment; check liver function tests (AST, LDH) and renal tests (BUN, creatinine) periodically during treatment; glucose, A1c; folic acid, vitamin $B_{12}$ q1-2yr
- **Surgery:** product should be discontinued temporarily for surgical procedures when patient is NPO, or if contrast media is used; resume when patient is eating
- **Megaloblastic anemia:** Monitor vitamin $B_{12}$, calcium levels q2yr

**BLACK BOX WARNING:** Monitor for **lactic acidosis:** malaise, myalgia, abdominal distress; risk increases with age, poor renal function; monitor electrolytes, lactate, pyruvate, blood pH, ketones, glucose; suspect in any diabetic patient with metabolic acidosis, with ketoacidosis; immediately stop product if hypoxemia, or significant renal dysfunction occurs; do not use in those >80 yr unless CCr is normal, alcohol use may increase lactic acidosis risk

- **Pregnancy/breastfeeding:** Avoid using in pregnancy, do not use in breastfeeding, if an antidiabetic is needed during pregnancy, insulin is usually used

### Patient/family education

- Teach patient to regularly self-monitor blood glucose using blood glucose meter
- Teach patient symptoms of hypo/hyperglycemia, what to do about each (rare)
- Advise patient that product must be continued on daily basis; explain consequence of discontinuing product abruptly
- Advise patient to take product in morning to prevent hypoglycemic reactions at night
- Advise patient to avoid OTC medications, alcohol unless approved by the prescriber
- Teach patient that diabetes is a lifelong illness; that this product controls symptoms, but does not cure the condition
- Teach patient to report adverse reactions if GI upset occurs, it decreases over time

**BLACK BOX WARNING:** **Teach patient symptoms of lactic acidosis**—hyperventilation, fatigue, malaise, myalgia, chills, somnolence—and to stop product/notify prescriber immediately, not to use in excess with chronic alcohol intake

- Teach patient to carry/wear emergency ID and glucagon emergency kit for emergencies
- Advise patient that glucophage XR tab may appear in stool
- Advise patient to take with meals, not to break, crush, chew ext rel product
- **Pregnancy:** Teach patient that PCOS patients with insulin resistance may be at risk of pregnancy; to use adequate contraception if pregnancy is not desired

## Evaluation

**Positive therapeutic outcome**
• Decrease in polyuria, polydipsia, polyphagia; clear sensorium; absence of dizziness; stable gait; blood glucose, A1C at normal level

**⚠ HIGH ALERT**

## methadone (Rx)

(meth'a-done)
**Dolophine, Metadol, Methadose**
*Func. class.:* Opioid analgesic
*Chem. class.:* Synthetic diphenylheptane derivative
**Controlled substance schedule II**

**Do not confuse:** methadone/methylphenidate

**ACTION:** Depresses pain impulse transmission at the spinal cord level by interacting with opioid receptors; produces CNS depression

**Therapeutic outcome:** Relief of pain; successful opioid withdrawal

**USES:** Severe pain, opiate withdrawal

**Unlabeled uses:** Bone pain

## CONTRAINDICATIONS

Hypersensitivity to this product, or hypersensitivity to chlorobutanol (inj route), asthma, ileus

**BLACK BOX WARNING:** Respiratory depression

**Precautions:** Pregnancy, breastfeeding, children <18 yr, geriatric, addictive personality, increased ICP, MI (acute), severe heart disease, respiratory depression, renal/hepatic disease, respiratory insufficiency, torsades de pointes, pulmonary disease, COPD, seizures

**BLACK BOX WARNING:** QT prolongation, pain, coadministration with other CNS depressants, IV use, pregnancy, requires an experienced clinician

## DOSAGE AND ROUTES

### Severe pain

**Adult:** PO 2.5 mg q8-12hr in opioid-naive, titrate; IV/IM/SUBCUT 2.5-10 mg q8-12hr in opioid-naive

### Opiate withdrawal

**Adult including pregnant women:** PO 20-30 mg initially, unless low opioid tolerance is expected, additional 5-10 mg q2-4hr as needed after initial dose, if symptoms continue may give for up to 5 days

### Renal/hepatic dose

**Adult:** PO may need to be modified

**Available forms:** Inj 10 mg/ml; tabs 5, 10 mg; oral sol 5, 10 mg/5 ml/(concentrate); 10 mg/ml/(concentrate); dispersible tabs 40 mg

## Implementation

• Medication should be slowly withdrawn after long-term use to prevent withdrawal symptoms

**PO route**
• When using during a methadone maintenance program, use only PO according to NATA guidelines
• May be given with food or milk to lessen GI upset
• Store in light-resistant container at room temperature
• PO is half as potent as parenteral

**IM/SUBCUT route**
• Do not give if cloudy or a precipitate has formed
• Give deeply in large muscle mass (IM); rotate inj sites
• Pain and induration may occur at site
• Protect from light

**IV route**
• Used as PCA
• Protect from light

## ADVERSE EFFECTS

**CNS:** *Drowsiness, dizziness, confusion, headache, sedation,* euphoria, seizures
**CV:** Palpitations, bradycardia, change in B/P, cardiac arrest, shock, hypotension, torsades de pointes, QT prolongation
**EENT:** Tinnitus, blurred vision, miosis, diplopia
**GI:** *Nausea, vomiting, anorexia, constipation, cramps,* biliary tract spasm
**GU:** Increased urinary output, dysuria, urinary retention, impotence
**INTEG:** *Rash,* urticaria, bruising, flushing, diaphoresis, pruritus
**RESP:** Respiratory depression, respiratory arrest

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO, SUBCUT, IM) |
| **Distribution** | Widely distributed; crosses placenta, half as active PO, as inj |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 2-3 hr; extended interval with continued dosing |

### Pharmacodynamics

| | PO | IM/SUBCUT |
|---|---|---|
| **Onset** | ½-1 hr | 20 min |
| **Peak** | 1-1.5 hr | 1½-2 hr |
| **Duration** | 4-12 hr | 4-6 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased respiratory depression, hypotension, sedation

Nalbuphine, pentazine, phenytoin, rifampin: decreased analgesia

Selegiline: do not use within 2 wk of methadone

### Drug classifications

Antipsychotics, opiates, sedative/hypnotics, skeletal muscle relaxants: increased respiratory depression, hypotension

Class IA antiarrhythmics (disopyramide, procainamide, quiNIDine), class III antiarrhythmics (amiodarone, bretylium, dofetilide, ibutilide, sotalol), astemizole, arsenic trioxide, bepridil, cisapride, chloroquine, clarithromycin, levomethadyl, pentamidine, some phenothiazines, pimozide, probucol, sparfloxacin, terfenadine: increased QT prolongation

CYP3A4 inducers (barbiturates, bosentan, carBAMazepine, efavirenz, phenytoins, nevirapine, rifabutin, rifampin): decreased methadone effect, withdrawal symptoms may occur

CYP3A4 inhibitors (aprepitant, antiretroviral protease inhibitors, clarithromycin, danazol, delavirdine, diltiazem, erythromycin, fluconazole, FLUoxetine, fluvoxaMINE, imatinib, ketoconazole, mibefradil, nefazodone, telithromycin, voriconazole): increased toxicity

MAOIs: do not use for 2 wk before taking methadone: unpredictable reactions

### Drug/food

Avoid use with grapefruit juice

### Drug/herb

Chamomile, hops, kava, valerian: increased CNS depression

St. John's wort: avoid use, withdrawal may result

### Drug/lab test

Increased: amylase, lipase

## NURSING CONSIDERATIONS

### Assessment

- **Assess for pain:** type, location, intensity, grimacing before and 1½-2 hr after administration; use pain scoring
- Monitor VS after parenteral route; note muscle rigidity, product history, liver, kidney function tests
- Monitor CNS changes: dizziness, drowsiness, hallucinations, euphoria, LOC, pupil reaction
- Monitor allergic reactions: rash, urticaria
- Monitor opioid detoxification: no analgesia occurs, only prevention of withdrawal symptoms
- **Beers:** Avoid in older adults unless safer alternatives are not available, may cause ataxia, impaired psychomotor function

**BLACK BOX WARNING:** Monitor B/P, pulse, ECG: hypotension, palpitations may occur

- Monitor bowel changes; bulk, fluids, laxatives should be used for constipation

**BLACK BOX WARNING: Respiratory dysfunction:** respiratory depression, character, rate, rhythm; notify prescriber if respirations <10/min, avoid use with other CNS depressants (benzodiazepines)

**BLACK BOX WARNING: QT prolongation:** may be dose related or use with other products that increase QT, titrate dose carefully

**BLACK BOX WARNING: Accidental exposure:** make sure product is not accessible to children, pets, may be fatal

**BLACK BOX WARNING: Overdose, poisoning:** advise persons involved in correct use

**BLACK BOX WARNING: Substance abuse:** may occur but has less psychological dependence than other opiate agonists

- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding, neonatal opioid withdrawal syndrome may occur and serious sedation of the infant

### Patient/family education

- Instruct patient to report any symptoms of CNS changes, allergic reactions, extreme sedation, trouble breathing; to avoid CNS depressants (alcohol, sedative-hypnotics) for at least 24 hr after taking this product
- Discuss with patient that dizziness, drowsiness, and confusion are common; to avoid getting up without assistance
- Discuss in detail with patient all aspects of the product
- **Pregnancy/breastfeeding:** Caution the patient not to use in pregnancy, breastfeeding

- Caution patient to make position changes slowly to prevent orthostatic hypotension
- Teach patient withdrawal symptoms may occur: nausea, vomiting, cramps, fever, faintness, anorexia
- Advise patient to maintain proper hydration, avoid alcohol use
- Teach patient to avoid use with other products without approval of prescriber; many drug interactions
- Teach patient to use exactly as directed, do not increase unless directed by prescriber
- Teach patient that drowsiness, dizziness may occur, not to perform hazardous tasks until effect is known, to ask for assistance when getting out of bed
- Teach patient that regular ECGs will be needed
- Teach patient to change positions slowly to minimize orthostatic hypotension
- Teach patient to advise all providers of product taken

### Evaluation

**Positive therapeutic outcome**
- Decreased pain
- Successful opioid withdrawal

## TREATMENT OF OVERDOSE:
Naloxone (Narcan) 0.2-0.8 mg **IV**, $O_2$, **IV** fluids, vasopressors

## methimazole (Rx)
(meth-im′a-zole)
**Tapazole**
*Func. class.:* Thyroid hormone antagonist (antithyroid)
*Chem. class.:* Thioamide

**Do not confuse:** methimazole/metoprolol/minoxidil

**ACTION:** Inhibits synthesis of thyroid hormones by decreasing iodine use in the manufacture of thyroglobin and iodothyronine; does not affect already formed hormones, does not affect circulatory $T_4$, $T_3$

**Therapeutic outcome:** Decreased $T_4$ levels, hyperthyroid symptoms

**USES:** Hyperthyroidism, preparation for thyroidectomy

## CONTRAINDICATIONS
Pregnancy, breastfeeding, hypersensitivity

**Precautions:** Infection, bone marrow depression, hepatic disease, bleeding disorders

## DOSAGE AND ROUTES
### Hyperthyroidism
**Adult:** PO 15 mg/day (mild hyperthyroidism); 30-40 mg/day (moderate-severe); 60 mg/day (severe); maintenance dosage 5-15 mg/day, may be divided
**Child:** PO 0.4 mg/kg/day in divided doses q8hr; continue until euthyroid; maintenance dosage 0.2 mg/kg/day in divided doses q8hr, max 30 mg/24 hr, may be divided

### Preparation for thyroidectomy
**Adult and child:** PO same as above; iodine may be added for 10 days before surgery

### Thyrotoxic crisis
**Adult and child:** PO same as hyperthyroidism with iodine and propranolol

**Available forms:** Tabs 5, 10, 15, 20 mg

### Implementation
- Give with meals to decrease GI upset; give at same time each day to maintain product level
- Give lowest dosage that relieves symptoms
- Store in light-resistant container
- Increase fluids to 3-4 L/day, unless contraindicated

## ADVERSE EFFECTS
**CNS:** *Drowsiness, headache, vertigo, fever,* paresthesias, neuritis
**ENDO:** *Enlarged thyroid*
**GI:** *Nausea, diarrhea, vomiting, jaundice,* hepatitis, loss of taste
**GU:** Nephritis
**HEMA:** Agranulocytosis, leukopenia, thrombocytopenia, hypothrombinemia, lymphadenopathy, bleeding, vasculitis
**INTEG:** *Rash, urticaria, pruritus, alopecia, hyperpigmentation,* lupuslike syndrome
**MS:** Myalgia, arthralgia, nocturnal muscle cramps

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Crosses placenta |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys, unchanged; breast milk |
| **Half-life** | 5-13 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | Peak 1-2 hr |
| **Duration** | 4-6 hr |

## INTERACTIONS

### Individual drugs

Amiodarone, potassium iodide: decreased effectiveness, methimazole dose may need to be increased
Digoxin: increased response, monitor digoxin level
Radiation: increased bone marrow depression
Warfarin: decreased anticoagulant effect, monitor coagulation studies

### Drug classifications

Antineoplastics: increased bone marrow depression

### Drug/lab test

Increased: pro-time, AST, ALT, alkaline phosphatase

## NURSING CONSIDERATIONS

### Assessment

- **Hyperthyroidism:** Assess for palpitations, nervousness/loss of hair, insomnia, heat intolerance, weight loss, diarrhea
- **Hypothyroidism:** Assess for constipation, dry skin, weakness, fatigue, headache, intolerance to cold, weight gain; adjustment may be needed
- Monitor pulse, B/P, temp; check I&O ratio; check for edema (puffy hands, feet, periorbitis); indicates hypothyroidism
- Check weight daily; same clothing, scale, time of day
- Monitor $T_3$, $T_4$, which are increased; serum TSH, which is decreased; free thyroxine index, which is increased if dosage is too low; discontinue product 3-4 wk before radioactive iodine uptake
- **Monitor blood studies:** CBC for blood dyscrasias (leukopenia, thrombocytopenia, agranulocytosis); if these occur, product should be discontinued and other treatment initiated; LFTs, may occur at higher doses >40 mg/day
- **Assess for hypersensitivity** (rash, enlarged cervical lymph nodes); product may have to be discontinued
- **Assess for hypoprothrombinemia** (bleeding, petechiae, ecchymosis)
- Monitor clinical response: after 3 wk should include increased weight, pulse, decreased $T_4$
- **Assess for bone marrow depression:** sore throat, fever, fatigue
- Check weight daily, same clothing, time of day, scale; weight increase or decrease is a sign of product need for adjustment
- **Pregnancy/breastfeeding:** May cause fetal harm, do not use in pregnancy, avoid use in breastfeeding

### Patient/family education

- Advise patient to abstain from breastfeeding after delivery; product appears in breast milk
- Instruct patient to take pulse daily; to keep graph of weight, pulse, mood
- Advise patient to report redness, swelling, sore throat, mouth lesions, which indicate blood dyscrasias
- Caution patient to avoid OTC products that contain iodine; that seafood and other iodine-containing products may be restricted by prescriber
- Caution patient not to discontinue this medication abruptly; thyroid crisis may occur; stress patient compliance
- Advise patient that response may take several mo if thyroid is large
- **Teach patient symptoms/signs of overdose:** periorbital edema, cold intolerance, mental depression; notify prescriber at once
- **Teach patient symptoms of inadequate dosage**: tachycardia, diarrhea, fever, irritability; prescriber should be notified to adjust
- Teach patient to take medication exactly as prescribed, not to skip or double doses; missed doses should be taken when remembered up to 1 hr before next dose
- Instruct patient to carry ID describing medication taken and condition being treated
- Teach patient to report yellowing of skin/legs, dark urine, anorexia, right upper abdominal pain, may indicate hepatic dysfunction

### Evaluation

**Positive therapeutic outcome**

- Decreased weight gain
- Decreased pulse
- Decreased $T_4$
- Decreased B/P

**⚠ HIGH ALERT**

## methotrexate (Rx)

(meth-oh-trex′ate)
**Rheumatrex, Trexall, Metoject**, **Otrexup, Xatmep, Rasuvo**
*Func. class.:* Antineoplastic, antimetabolite
*Chem. class.:* Folic acid antagonist

**Do not confuse:** methotrexate/metolazone/mitoxantene

**ACTION:** Inhibits an enzyme that reduces folic acid, which is needed for nucleic acid synthesis in all cells; cell cycle specific (S phase); immunosuppressive

**Therapeutic outcome:** Prevention of rapidly growing malignant cells; immunosuppression

**USES:** Acute lymphocytic leukemia, in combination for breast, lung, head, neck carcinoma, lymphoma, sarcoma, gestational choriocarcinoma, hydatidiform mole, psoriasis, rheumatoid arthritis, mycosis fungoides, osteosarcoma

## CONTRAINDICATIONS

Hypersensitivity, leukopenia (<3500/mm$^3$), thrombocytopenia (<100,000/mm$^3$), anemia, psoriatic patients with severe renal disease, alcoholism, HIV infection, AIDS

**BLACK BOX WARNING:** Pregnancy, exfoliative dermatitis, bone marrow suppression

**Precautions:** Breastfeeding, children

**BLACK BOX WARNING:** Renal disease, ascites, diarrhea, infection, intrathecal administration, lymphoma, pleural effusion, pulmonary toxicity, radiation therapy, stomatitis, tumor lysis syndrome, ascites, stomatitis, gastroenteritis, GI bleeding, perforation, hepatotoxicity, intrauterine fetal death, neurotoxicity, requires experienced clinician

## DOSAGE AND ROUTES

### Acute lymphocytic leukemia

**Adult and child:** PO/IM/**IV** 3.3 mg/m$^2$/day × 4-6 wk until remission with prednisone 60 mg/m$^2$/day, then 20-30 mg/m$^2$ PO/IM qwk in 2 divided doses or 2.5 mg/kg **IV** q2wk

### Burkitt's lymphoma (stages I, II, III) (unlabeled)

**Adult:** PO 10-25 mg/day × 4-8 days with 7-day rest period

**Child ≥3 yr:** intrathecally 12 mg q2-5days; child 2-3 yr 10 mg q2-5days; child 1-2 yr: 8 mg q2-5days

### Meningeal leukemia

**Adult:** 12 mg/m$^2$ IT q2-5days until CSF is normal, then one additional dose, max 15 mg

### Choriocarcinoma, hydatidiform mole

**Adult and child:** PO/IM 15-30 mg/kg/day × 5 days, then off 1 wk; may repeat m × 5 courses

### Breast cancer

**Adult:** **IV** 40-60 mg/m$^2$ on day 1 of every 21-28 days with other antineoplastics

### Epidermal head/neck cancer

**Adult/child:** **IV** 40 mg/m$^2$ on days 1 and 15, q21 days alone or in combination with bleomycin, CISplatin

**Adult:** PO 25-50 mg/m$^2$ q7 days
**Child:** PO 7.5-30 mg/m$^2$ q7-14 days

### Rheumatoid arthritis

**Adult:** PO 7.5 mg/wk or divided doses of 2.5 mg q12hr × 3 dose qwk, max 20 mg/wk

### Polyarticular-course juvenile RA

**Child:** PO/IM 10 mg/m$^2$ qwk

### Osteosarcoma

**Adult and child:** **IV** 12 g/m$^2$ given over 4 hr, then leucovorin rescue is given

### Mycosis fungoides

**Adult:** PO 2.5-10 mg/day until cleared (may be many mo); IM 50 mg qwk or 15-37.5 mg 2 ×/wk

### Psoriasis

**Adult:** PO/IM/**IV** 10-25 mg qwk or 2.5 mg PO q12hr × 3 doses qwk; may increase to 25 mg qwk, max 30 mg/wk

### Renal/hepatic dose

**Adult:** PO/IM/IV
CCr 46-60 ml/min give 65% of standard dose;
CCr 31-45 ml/min give 50% of standard dose;
CCr ≤30 ml/min not recommended

**Available forms:** Tabs 2.5, 5, 7.5, 10, 15 mg; inj 25 mg/ml (2, 4, 8, 10, 20, 40 vials); 25 mg/ml (2,10 ml vials with benzyl alcohol); lyophilized powder: 2.5 mg/ml, 2.5 mg/ml in 1000 mg preservative-free vials; oral solution 2.5 mg/ml; autoinjector: 7.5 mg/0.15 ml, 7.5 mg/0.4 ml, 10 mg/0.2 ml, 10 mg/0.4 ml, 12.5 mg/0.25 ml, 15 mg/0.3 ml, 15 mg/0.4 ml, 17.5 mg/0.35 ml, 20 mg/0.4 ml, 22.5 mg/0.45 ml, 25 mg/0.4 ml, 25 mg/0.5 ml, 27.5 mg/0.55 ml, 30 mg/0.6 ml

### Implementation

- Avoid contact with skin, since product is very irritating; wash completely to remove
- **Leucovorin rescue:** Administer leucovorin calcium within 24 hr of giving this product to prevent tissue damage; check agency policy; continue until methotrexate level <$10^{-8}$ m
- Give antiemetic 30-60 min before giving product and prn to prevent vomiting; administer antibiotics for infection prophylaxis
- Give in AM so product can be eliminated before bedtime
- Provide liquid diet: carbonated beverages; gelatin may be added if patient is not nauseated or vomiting

**PO route**

- Give 1 hr before or 2 hr after meals to prevent vomiting
- Make sure product is taken weekly in RA, JRA

**IM route**
- Give deeply in large muscle mass
- Store in tightly closed container in cool environment; store inj, powder for inj in dark, dry area
- Use safe handling procedures for chemotherapeutic agents

**PO route**
- This route is preferred for low-dose therapy
- Methotrexate absorption is dose dependent; absorption of single doses more than 40 mg/m$^2$ is significantly less than that of lower doses
- Weekly therapy with Rheumatrex Dose Packs is not intended for doses more than 15 mg PO/wk

**Oral liquid formulations**
- Instruct patients and caregivers that the recommended dose should be taken weekly as directed. Mistaken daily use of the recommended dose has led to fatal toxicity
- Measure using a calibrated oral measuring device for accurate dosage administration
- **Storage:** Store at room temperature (68 to 77° F) for up to 60 days

**Injectable routes**
- Visually inspect parenteral products for particulate matter and discoloration before use
- The preserved solutions contain benzyl alcohol and should not be used for intrathecal, intermediate-, or high-dose therapy

**Reconstitution of lyophilized powders:** Reconstitute each vial with an appropriate sterile, preservative-free solution such as 5% dextrose injection or 0.9% sodium chloride injection. Reconstitute the 25-mg vial to a concentration no greater than 25 mg/ml. The 1-g vial should be reconstituted with 19.4 ml to a concentration of 50 mg/ml; prepare immediately before use. Discard any unused portions

**IV route**

**Direct IV injection:** Inject as a slow push via Y-site or three-way stopcock into a free-flowing IV infusion

**Intermittent/continuous IV infusion:** Further dilute solution in 5% dextrose injection, 5% dextrose, and 0.9% sodium chloride injection, or 0.9% sodium chloride injection; before infusion, check vein patency by flushing with 5 to 10 ml of 5% dextrose injection or 0.9% sodium chloride injection; infuse at a rate recommended by the prescriber. After infusion, flush the IV tubing.

**Guidelines for IV infusion of intermediate- or high-dose methotrexate (500 mg/m$^2$ over less than 4 hr or more than 1 g/m$^2$ over more than 4 hr):**
- Before use, the following laboratory parameters should be confirmed: WBC >1,500/mm$^3$, neutrophil count >200/mm$^3$, platelet count >75,000/mm$^3$, serum bilirubin <1.2 mg/dl, normal serum creatinine, and SGPT <450 U. Creatinine clearance should be >60 ml/min. If serum creatinine has increased by 50% or more compared with a prior value, creatinine clearance should be measured and documented as more than 60 ml/min even if the serum creatinine is still within normal limits
- Previous mucositis should be healed and persistent effusions should be drained before use
- Give 1 L/m$^2$ of IV over 6 hr before initiation of the methotrexate infusion; continue hydration at 125 ml/m$^2$/hr during the methotrexate infusion and for 2 days after the infusion has been completed
- Alkalinize the urine using sodium bicarbonate to maintain the urine pH more than 7 during the methotrexate infusion and leucovorin therapy. This can be done orally or by incorporating the sodium bicarbonate in the intravenous fluids.
- Repeat serum creatinine and methotrexate serum level determinations 24 hr after starting methotrexate and at least daily until the methotrexate level is below 5 × 10-8mol/L (0.05 micro-M)

**IM route**
- Inject deeply into a large muscle
- Aspirate before injection to avoid injection into a blood vessel

**SUBCUT route**
- Otrexup and Rasuvo are methotrexate formulations for SUBCUT use only
- Both Otrexup and Rasuvo are single-use autoinjectors. Otrexup is available in 5-mg increments for doses between 10 and 25 mg; Rasuvo is available in 2.5-mg increments for doses between 7.5 and 30 mg. Otrexup is yellow in color, and Rasuvo is yellow to brown in color. Neither formulation should have lumps or particles floating in it
- Administer Otrexup and Rasuvo in the abdomen or thigh; do NOT administer within 2 inches of the navel; on the arms; on any other areas of the body; or on skin that is tender, bruised, red, scaly, hard, or has scars or stretch marks
- If self-injection is deemed appropriate, patients or caregivers should practice injections using a training device with guidance from a health care professional.

**Use of the Otrexup autoinjector**
- Immediately before use, twist cap to remove; flip the safety clip

• Place the needle end of Otrexup against the thigh or stomach (abdomen) at a 90-degree angle and firmly push until you hear a click; hold for 3 sec before removing the autoinjector
• Press a cotton ball or gauze on the area for 10 sec; do not rub the injection site
• After use, the viewing window will be blocked to show that the medicine was given. If the viewing window is not blocked, call your doctor, pharmacist, or 855-Otrexup (855-687-3987) for help
• Do not inject another Otrexup dose without talking to your doctor

**Use of the Rasuvo autoinjector**

• Immediately before use, pull the yellow cap straight off. Do not twist the cap
• Pinch a pad of skin surrounding a cleaned injection site (thigh or abdomen) with the thumb and forefinger. Position the uncapped transparent end of the autoinjector at a 90-degree angle to the skin. Without pressing the button, push firmly onto the skin until the stop point is felt, which will unlock the yellow injection button
• Press the yellow injection button until a click is heard, which indicates the start of the injection. Hold Rasuvo against the skin until all medication is injected. This can take up to 5 sec. It is not necessary to keep the button of the Rasuvo autoinjector pressed down after the injection has begun
• To avoid incomplete injection, do not remove Rasuvo from the skin before the end of the injection. Look at the transparent control zone while injecting to make sure the entire dose is injected. When movement stops, the injection is complete
• Pull straight up to remove Rasuvo from the injection site. The protective needle shield should automatically move into place
• Visually inspect the transparent control zone to ensure no liquid is left in the syringe. If liquid is left, not all of the medicine was injected. The physician should be contacted. Do not use another Rasuvo unless advised by the doctor

**Intrathecal administration**

• Use preservative-free solutions. The preserved solutions contain benzyl alcohol and should NOT be used for intrathecal therapy
• Reconstitute the preservative-free powder for injection with preservative-free 0.9% sodium chloride injection. The desired dose should be drawn into a 5- to 10-ml syringe
• After lumbar puncture is complete, withdraw an amount of CSF equivalent to the volume of methotrexate injection to be administered. If the puncture was traumatic, wait 2 days before attempting to administer methotrexate intrathecally
• Allow CSF (approximately 10% of estimated CSF total volume) to flow into the syringe and mix with the product
• Inject intrathecally over 15 to 30 sec with the bevel of the needle directed upward

**Y-site compatibilities:** Acyclovir, alemtuzumab, alfentanye, allopurinol, amifostine, aminophylline, asparaginase, aztreonam, bleomycin, cefepime, cefTRIAXone, cimetidine, CISplatin, cyclophosphamide, cytarabine, DAUNOrubicin, dexchlorpheniramine, diphenhydrAMINE, doripenem, DOXOrubicin, etoposide, famotidine, filgrastim, fludarabine, fluorouracil, furosemide, gallium, ganciclovir, granisetron, heparin, HYDROmorphone, imipenem-cilastatin, leucovorin, LORazepam, melphalan, mesna, methylPREDNISolone, metoclopramide, mitoMYcin, morphine, ondansetron, oxacillin, PACLitaxel, piperacillin/tazobactam, prochlorperazine, ranitidine, sargramostim, teniposide, thiotepa, vinBLAStine, vinCRIStine, vinorelbine, zoledronic acid

**Y-site incompatibilities:** Droperidol, IDArubicin

**Solution compatibilities:** Amino acids, 4.25%/$D_{25}$, $D_5W$, sodium bicarbonate 0.05 mol/L, 0.9% NaCl

**BLACK BOX WARNING: Intrathecal route:** use preservative-free solutions, reconstitute with normal saline, the dose should be drawn into a 5-10 ml syringe after lumbar puncture, the volume of CSF should be withdrawn equal to volume of methotrexate, allow CSF to flow into syringe and mix, inject over 15-30 sec with bevel of needle upward

## ADVERSE EFFECTS

**CNS:** Dizziness, seizures, headache, confusion, encephalopathy, hemiparesis, malaise, fatigue, chills, fever, leukoencephalopathy, arachnoiditis (intrathecal)
**EENT:** Blurred vision, optic neuropathy
**GI:** *Nausea, vomiting, anorexia, diarrhea, ulcerative stomatitis,* hepatotoxicity, cramps, ulcer, gastritis, GI hemorrhage, abdominal pain, hematemesis, hepatic fibrosis, acute toxicity
**GU:** Urinary retention, renal failure, menstrual irregularities, defective spermatogenesis, hematuria, azotemia, uric acid nephropathy
**HEMA:** Leukopenia, thrombocytopenia, myelosuppression, anemia
**INTEG:** *Rash, alopecia,* dry skin, urticaria, photosensitivity, folliculitis, vasculitis, petechiae,

ecchymosis, acne, alopecia, severe fatal skin reactions
**RESP:** Methotrexate-induced lung disease
**SYST:** Sudden death, *Pneumocystis jiroveci* pneumonia, tumor lysis syndrome, secondary malignancy

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (GI) |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys, unchanged; breast milk (minimal) |
| **Half-life** | Terminal 10-12 hr; increased in renal disease |

### Pharmacodynamics

| | PO | IM/IV | IT |
|---|---|---|---|
| **Onset** | Unknown | Unknown | Unknown |
| **Peak** | 1-4 hr | ½-2 hr | Unknown |
| **Duration** | Unknown | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Acitretin: increased hepatitis; avoid concurrent use
Alcohol, phenylbutazone, probenecid, radiation, theophylline: increased toxicity
Digoxin (PO), fosphenytoin, phenytoin: decreased effect of each specific product
Folic acid: decreased effect of methotrexate, asparaginase
Radiation: increased bone marrow suppression

### Drug classifications

Anticoagulants (oral): increased hypoprothrombinemia
Antineoplastics, NSAIDs, penicillins, salicylates, sulfa products: increased toxicity
Live virus vaccines: decreased antibodies
Proton pump inhibitors: do not use concurrently

## NURSING CONSIDERATIONS

### Assessment

- Assess buccal cavity q8hr for dryness, sores or ulceration, white patches, oral pain, bleeding, dysphagia; obtain prescription for viscous lidocaine (Xylocaine)
- **Assess symptoms indicating severe allergic reaction:** rash, pruritus, urticaria, purpuric skin lesions, itching, flushing
- Assess tachypnea, ECG changes, dyspnea, edema, fatigue; identify dyspnea, crackles, unproductive cough, chest pain, tachypnea

**BLACK BOX WARNING: Infection:** those with active infections should be treated for infection prior to product use; monitor temperature, fever may indicate beginning of infection, more common during neutropenia

- **Bone marrow suppression:** Monitor CBC, differential, platelet count weekly; avoid use until WBC is >1500/mm$^3$ or platelet count is >75,000/mm$^3$, neutrophils >200/mm$^3$, notify prescriber of results if WBC <20,000/mm$^3$, platelets <150,000/mm$^3$; WBC, platelet nadirs occur on day 7; monitor
- Assess for increased uric acid levels, swelling, joint pain primarily in extremities; patient should be well hydrated to prevent urate deposits
- Make sure drug-drug interacting products are discontinued prior to therapy, and do not resume until methotrexate level is safe

**BLACK BOX WARNING: Nephrotoxicity:** avoid use in renal failure; monitor renal function studies: BUN, creatinine, serum uric acid, urine CCr before, during therapy; check I&O ratio; report fall in urine output to <30 ml/hr

**BLACK BOX WARNING: Hepatotoxicity:** monitor liver function tests before, during therapy (bilirubin, AST, ALT, LDH) as needed or monthly; check for jaundice of skin and sclera, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea (hepatotoxicity)

- **Bleeding:** Assess for bleeding: blood in emesis hematuria, stool guaiac, bruising or petechiae, mucosa or orifices; check for inflammation of mucosa, breaks in skin, avoid IM injections, rectal temperature when platelets are low
- Identify effects of alopecia on body image; discuss feelings about body changes
- Identify edema in feet, joint and stomach pain, shaking; prescriber should be notified
- Monitor methotrexate levels, adjust leucovorin dose based on the level
- Monitor vital signs during use, report changes if significant
- Monitor for stomatitis, diarrhea, abdominal cramping or pain, if severe discontinue product
- Anemia: Assess for extreme fatigue, increased heartbeat, dyspnea, headache, dizziness, pale skin
- Gout: Assess for joint warmth, pain, edema, increased uric acid level, use allopurinol and alkalinization of urine will decrease uric acid

M

**BLACK BOX WARNING: Pulmonary toxicity:** those with ascites or pleural effusions are at greater risk for toxicity, fluid should be removed before treatment, monitor plasma methotrexate level, may start with dry, nonproductive cough

**BLACK BOX WARNING: Tumor lysis syndrome:** hyperkalemia, hyperphosphatemia, hyperuricemia, hypocalcemia, decreased urine output; use aggressive hydration and allopurinol to correct severe electrolyte imbalances, renal toxicity

**BLACK BOX WARNING: Serious skin reaction:** Stevens-Johnson syndrome, exfoliative dermatitis, skin necrosis, erythema multiforme may occur within days of receiving product by any route; product should be discontinued

- **Strokelike encephalopathy:** common in high-dose therapy; assess for confusion, hemiparesis, seizures, coma; usually transient
- **Rheumatoid arthritis:** ROM, pain, joint swelling, prior to and during treatment
- **Psoriasis:** assess skin lesions prior to and during treatment

### Patient/family education

- Encourage patient to rinse mouth tid-qid with water, club soda; brush teeth bid-qid with soft brush or cotton-tipped applicators for stomatitis; use unwaxed dental floss

**BLACK BOX WARNING: Pregnancy, breastfeeding:** Advise patient that contraceptive measures for women and men are recommended during therapy; product is teratogenic; contraception should be used for 3 mo (male) and 4-6 wk (female); to discontinue breastfeeding; toxicity to infant may occur

**BLACK BOX WARNING:** Teach patient to avoid use of products containing aspirin or NSAIDs, razors, commercial mouthwash, since bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools)

- Caution patient to report signs of anemia (fatigue, headache, irritability, faintness, shortness of breath); seizures
- **Pulmonary toxicity:** Advise patient to report any changes in breathing or coughing even several mo after treatment; to avoid crowds and persons with respiratory tract or other infections
- Advise patient to report stomatitis: any bleeding, white spots, ulcerations in mouth to prescriber; tell patient to examine mouth daily, report symptoms, use good oral hygiene
- Teach patient that hair may be lost during treatment; a wig or hairpiece may make patient feel better; new hair may be different in color, texture
- Caution patient not to have any vaccinations without the advice of the prescriber; serious reactions can occur
- Advise patient to use sunblock or protective clothing to prevent burns
- Teach patient to use good dental care, to prevent overgrowth of infection in the mouth, to use soft bristle toothbrush
- Teach patient how to use this product with leucovorin rescue
- Teach patient to continue leucovorin until told it is safe to stop
- Teach patient to report CNS symptoms, vision changes
- Teach patient to report fever, other symptoms of infection
- Teach patient to report decreased urine output
- Teach patient to advise all providers that methotrexate is being used, not to take Rx, OTC, herbs, supplements unless approved by prescriber
- SUBCUT route: Teach patient self-injection technique and use, disposal of equipment

### Evaluation

**Positive therapeutic outcome**

- Prevention of rapid division of malignant cells
- Decreased joint inflammation in RA

**⚠ HIGH ALERT**

## methyldopa/methyldopate (Rx)

(meth-ill-doe'pa)

*Func. class.:* Antihypertensive

*Chem. class.:* Centrally acting α-adrenergic inhibitor

**Do not confuse:** methyldopa/L-dopa (levodopa)

**ACTION:** Stimulates central inhibitory $\alpha_2$-adrenergic receptors or acts as false transmitter, resulting in reduction of arterial pressure

**Therapeutic outcome:** Decreased B/P in hypertension

**USES:** Hypertension, hypertensive crisis

**CONTRAINDICATIONS**

Active hepatic disease, hypersensitivity, MAOI therapy

**Precautions:** Pregnancy, geriatric patients, cardiac disease, autoimmune disease, depression, dialysis, hemolytic anemia, Parkinson's disease, pheochromocytoma, sulfite hypersensitivity

## DOSAGE AND ROUTES

### Hypertension/hypertensive crisis

**Adult:** PO 250-500 mg bid or tid, then adjusted q2day prn, 0.5-2 g/day in 2-4 divided doses (maintenance), max 3 g/day; **IV** 250-500 mg in 100 ml $D_5W$ q6hr, run over 30-60 min, max 1 g q6hr, switch to PO as soon as possible

**Child:** PO 10 mg/kg/day in 2-4 divided doses, max 65 mg/kg or 3 g/day, whichever is less; **IV** 20-40 mg/kg/day in 4 divided doses, max 65 mg/kg or 3 g, whichever is less

### Renal dose

**Adult:** PO CCr 10-50 ml/min dose q8-12hr; CCr <10 ml/min dose q12-24hr

**Available forms:** Methyldopa: tabs 125, 250, 500 mg; methyldopate: inj 50 mg/ml (250 mg/5 ml)

### Implementation

#### PO route

- Give before meals
- Shake susp before using
- Store in airtight container at room temperature
- Product should not be withdrawn abruptly
- Increase in dose should be done in the evening to minimize drowsiness

#### Intermittent IV infusion route

- Give after diluting in 100 ml of 0.9% NaCl, $D_5W$, $D_2$/0.9% NaCl, 5% sodium bicarbonate, Ringer's; administer over 30-60 min

**Y-site compatibilities:** Alemtuzumab, alfentanil, amikacin, aminophylline, anidulafungin, ascorbic acid, atenolol, atracurium, atropine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, caspofungin, cefamandole, ceFAZolin, cefmetazole, cefonicid, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, cephalothin, chlorproMAZINE, cimetidine, clindamycin, cyanocobalamin, cycloSPORINE, DACTINomycin, DAPTOmycin, dexamethasone, digoxin, diltiazem, diphenhydrAMINE, DOCEtaxel, DOPamine, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epoetin alfa, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, insulin(regular), irinotecan, isoproterenol, labetalol, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, meperidine, metaraminol, methicillin, methoxamine, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, mezlocillin, miconazole, midazolam, milrinone, minocycline, mitoXANtrone, morphine, moxalactam, multiple vitamins, mycophenolate mofetil, nafcillin, nalbuphine, naloxone, netilmicin, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, pantoprazole, papaverine, PEMEtrexed, penicillin G potassium/sodium, pentazocine, phentolamine, phenylephrine, phytonadione, piperacillin, polymyxin B, potassium chloride, procainamide, prochlorperazine, promethazine, propranolol, protamine, pyridoxine, quiNIDine, ranitidine, ritodrine, sodium bicarbonate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinorelbine, voriconazole, zoledronic acid

**Solution compatibilities:** $D_5W$, $D_2$/0.9% NaCl, Ringer's, sodium bicarbonate 5%, 0.9% NaCl, amino acids 4.25%/$D_{25}$, Dextran$_6$/0.9% NaCl, Normosol R, Normosol M/$D_5W$

## ADVERSE EFFECTS

**CNS:** *Drowsiness, weakness, dizziness, sedation, headache,* depression, psychosis, paresthesias, parkinsonism, Bell's palsy, nightmares, drug fever

**CV:** Bradycardia, myocarditis, orthostatic hypotension, angina, edema, weight gain, HF, paradoxical pressor response (**IV** use)

**EENT:** Nasal congestion

**ENDO:** Breast enlargement, gynecomastia, amenorrhea

**GI:** Nausea, vomiting, diarrhea, constipation, hepatic dysfunction, sore or "black" tongue, pancreatitis, colitis, flatulence

**GU:** Impotence, failure to ejaculate

**HEMA:** Leukopenia, thrombocytopenia, hemolytic anemia, granulocytopenia, positive Coombs' test

**INTEG:** Lupuslike syndrome, rash, toxic epidural necrolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 50% (PO) |
| **Distribution** | Crosses placenta, blood-brain barrier |
| **Metabolism** | Liver, moderately |
| **Excretion** | Kidneys, unchanged (partially) |
| **Half-life** | 1½ hr |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | Onset 4-6 hr | Unknown |
| **Peak** | 4-6 hr | Onset 4-6 hr |
| **Duration** | 24-48 hr | 10-16 hr |

## INTERACTIONS

### Individual drugs

Alcohol: CNS depression
Haloperidol: increased psychosis
Iron: decreased methyldopa absorption
Levodopa: increased CNS toxicity, hypotension
Lithium: increased lithium toxicity
TOLBUTamide: increased hypoglycemia

### Drug classifications

Amphetamines, antidepressants (tricyclics), barbiturates, NSAIDs, phenothiazines: decreased antihypertensive effect
Analgesics, antidepressants, antihistamines, sedative/hypnotics: increased CNS depression
Antihypertensives, diuretics: increased hypotension
β-Adrenergic blockers: increased B/P
MAOIs: increased pressor effect, do not use concurrently
Sympathomimetic amines: increased pressor effect

### Drug/lab test

Increased: creatinine, LFTs
Decreased: platelets, WBC, Hgb/Hct
Interference: urinary uric acid, serum creatinine, AST
False increase: urinary catecholamines

## NURSING CONSIDERATIONS

### Assessment

- **Hemolytic anemia:** monitor blood tests: CBC, neutrophils, decreased platelets; direct Coombs' test before, after 6, 12 mo of therapy; a positive test may indicate hemolytic anemia; usually reverses within weeks to months after discontinuing treatment, monitor Hgb/Hct and RBC, do not start therapy in those with hemolytic anemia
- Monitor renal studies: protein, BUN, creatinine; watch for increased levels that may indicate nephrotic syndrome: polyuria, oliguria, frequency; report weight gain >5 lb
- **Drug-induced hepatitis/drug fever:** usually subsides within 3 months of discontinuing therapy
- **Product tolerance:** may occur within 3 mo of starting treatment; dosage change and other products may be needed
- Obtain baselines in renal, liver function tests before therapy begins; check potassium levels, although hyperkalemia rarely occurs
- Monitor B/P, pulse if the product is being used for hypertension; notify prescriber of changes
- Monitor edema in feet, legs daily; monitor I&O; check weight for decreasing output
- Assess for allergic reaction: rash, fever, pruritus, urticaria; product should be discontinued if antihistamines fail to help
- Monitor CNS symptoms, especially in the geriatric; depression; change in mental status
- **Pregnancy/breastfeeding:** Use cautiously in pregnancy, breastfeeding; has been used for pregnancy-induced hypertension

### Patient/family education

- Instruct patient not to discontinue product abruptly, or withdrawal symptoms may occur: anxiety, increased B/P, headache, insomnia, increased pulse, tremors, nausea, sweating
- Caution patient not to use OTC (cough, cold, or allergy) products unless directed by prescriber
- Teach patient about excessive perspiration, dehydration, vomiting, diarrhea; may lead to fall in B/P; consult prescriber if these occur
- Advise patient that product may cause dizziness, fainting; light-headedness may occur during 1st few days of therapy; that product may cause dry mouth, use hard candy, saliva product, or frequent rinsing of mouth; caution patient to change position slowly, to rise slowly to sitting or standing position to minimize orthostatic hypotension, especially geriatric
- Caution patient that compliance is necessary; not to skip or stop product unless directed by prescriber
- Teach patient that product may cause skin rash
- Teach patient to avoid hazardous activities, since product may cause drowsiness, dizziness
- **Beers:** Avoid in older adults, high risk of CNS effects, may cause bradycardia and orthostatic hypotension

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P

## TREATMENT OF OVERDOSE:

Gastric evacuation, sympathomimetics may be indicated if severe; hemodialysis

## methylergonovine (Rx)

(meth-ill-er-goe-noe'veen)
**Methergine**
*Func. class.:* Oxytocic
*Chem. class.:* Ergot alkaloid

**ACTION:** Stimulates uterine and vascular smooth muscle, causing contractions, decreased bleeding, arterial vasoconstriction

**Therapeutic outcome:** Absence of hemorrhage

**USES:** Prevention, treatment of hemorrhage postpartum or after abortion, uterine contractions

## CONTRAINDICATIONS

Pregnancy (4th stage of labor [other than obstetric delivery/abortion]), hypersensitivity to ergot preparations, preeclampsia, eclampsia, elective induction of labor

**Precautions:** Severe renal/hepatic disease, jaundice, diabetes mellitus, seizure disorders, sepsis, CAD, last stage of labor

## DOSAGE AND ROUTES

**Adult:** PO 200 mcg tid-qid up to 7 days; IM/**IV** 200 mcg q2-4hr for 1-5 doses

**Available forms:** Inj 200 mcg/ml; tabs 200 mcg

### Implementation

**PO route**

- PO is the preferred route
- Do not exceed dosage limits
- Store tabs at room temperature
- Give with water

**IM route**

- Give inj deeply in large muscle mass, aspirate
- Protect from light

**Direct IV route**

- Give by this route for severe, life-threatening hemorrhage
- Give directly undiluted or diluted with 5 ml of 0.9% NaCl given through Y-site or 3-way stopcock; give 0.2 mg/min; use clear, colorless sol
- Store up to 2 mo if unused

**Y-site compatibilities:** Heparin, hydrocortisone sodium succinate, potassium chloride, vit B/C

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness,* seizures, hallucinations, stroke (IV)
**CV:** Hypotension, chest pain, palpitations, *hypertension,* dysrhythmias; CVA (**IV**)
**EENT:** Tinnitus
**GI:** *Nausea, vomiting*
**GU:** Cramping
**INTEG:** Sweating, rash, allergic reactions
**MS:** Leg cramps
**RESP:** *Dyspnea*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO, IM) |
| **Distribution** | Unknown |
| **Metabolism** | Liver, possibly |
| **Excretion** | Unknown |
| **Half-life** | ½-2 hr |

### Pharmacodynamics

| | PO | IM | IV |
|---|---|---|---|
| **Onset** | 5-15 min | 5 min | Immediate |
| **Peak** | Unknown | Unknown | Unknown |
| **Duration** | 3 hr | 3 hr | Unknown |

## INTERACTIONS

### Individual drugs

Smoking: increased vasoconstriction

### Drug classifications

CYP3A4 inhibitors: increased ergot toxicity, do not use together
Vasopressors, ergots, anesthetics (regional): increased vasoconstriction

## NURSING CONSIDERATIONS

### Assessment

- Monitor B/P, pulse; watch for change that may indicate hemorrhage
- Assess fundal tone, nonphasic contractions; check for relaxation or severe cramping
- **Assess for ergotism or overdose:** nausea, vomiting, weakness, muscular pain, insensitivity to cold, paresthesia of extremities; product should be decreased or infusion discontinued
- Before administering ergonovine, check calcium levels; if hypocalcemia is present, correction should be made to increase effectiveness of this product
- Monitor prolactin levels and for decreased breast milk production
- **Pregnancy/breastfeeding:** Do not use in pregnancy except after obstetric delivery or abortion to reduce hemorrhage risk, may breastfeed 1 wk postpartum to control uterine bleeding

### Patient/family education

- Inform patient that abdominal cramps are a side effect of this medication
- Instruct patient to notify prescriber if chest pain, nausea, vomiting, headache, muscle pain, weakness, or cold, numb extremities occur

### Evaluation

**Positive therapeutic outcome**

- Prevention of hemorrhage

## methylnaltrexone (Rx)

(meth-il-nal-trex′one)
**Relistor**
*Chem. class.:* Opioid antagonist
*Func. class.:* GI agent

**ACTION:** Peripheral mu-opioid receptor antagonist that reduces constipation associated with opiate agonists

**Therapeutic outcome:** Decreased constipation

**USES:** Treatment of opioid-induced constipation in patients with advanced illness who are receiving palliative care when response to laxative therapy has been insufficient, opioid-induced constipation in chronic noncancer pain

## CONTRAINDICATIONS

Hypersensitivity, GI obstruction, **IV** route, eclampsia, elective induction of labor, hypertension, preeclampsia, pregnancy

**Precautions:** Pregnancy, breastfeeding, renal disease, children, diarrhea, driving, operating machinery, geriatric patients, neoplastic disease, Crohn's disease, peptic ulcer, ulcerative colitis

## DOSAGE AND ROUTES

### Opiate-agonist induced constipation

**Adult >114 kg:** SUBCUT 0.15 mg/kg every other day prn
**Adult 62-114 kg:** SUBCUT 12 mg every other day prn, max 12 mg/24 hr
**Adult 38-62 kg:** SUBCUT 8 mg every other day prn, max 8 mg/24 hr
**Adult <38 kg:** SUBCUT 0.15 mg/kg every other day prn, max 0.15 mg/kg/24 hr

### Opioid-induced constipation with noncancer pain

**Adult:** SUBCUT 12 mg qday, discontinue laxative before starting this product

### Renal dose

**Adult:** SUBCUT CCr <60 ml/min, reduce normal adult dose by 50%

**Available forms:** Solution for inj 12 mg/0.6 ml, (single-use vials) 8 mg/0.4 ml (prefilled syringes); tab 150 mg

### Implementation

- Give SUBCUT only; oral dose is investigational and not currently available
- Do not give **IV; IV** dosing for urinary retention is investigational
- Store at 15°-30° C (59°-86° F); do not freeze
- Store away from light

**SUBCUT route**

- Inspect the solution before use; it should be a clear, colorless to pale yellow aqueous solution; do not use if particulate matter or discoloration are present
- Withdraw the needed amount of solution into a sterile syringe; if immediate administration is impossible, the syringe may be kept at room temperature for up to 24 hr; the syringe does not need to be kept away from light during the 24-hr period; immediately discard any unused portion in the vial; no preservatives are present
- Administer into the upper arm, abdomen, or thigh no more than 1 ×/24 hr; rotate inj sites; do not inject the same spot each time; do not inject into areas where skin is tender, bruised, red, or hard; avoid areas with scars or stretch marks
- If using with retractable needle, slowly push down on the plunger past the resistance point until the syringe is empty and a click is heard

## ADVERSE EFFECTS

**CNS:** Dizziness
**GI:** Nausea, vomiting, diarrhea, flatulence, abdominal pain, GI perforation
**INTEG:** Hyperhidrosis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 11%-15.3% |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Terminal 8 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 30 min (SUBCUT) |
| **Duration** | Unknown |

## NURSING CONSIDERATIONS

### Assessment

- Monitor serum creatinine
- **Opioid-induced constipation:** assess for stool characteristics: amount, consistency; bowel sounds during treatment
- Teach patient to notify prescriber before taking all other OTC, Rx, or herbal products
- Teach patient not to drive or perform other hazardous activities until response is known, dizziness may occur
- Teach patient to continue other products for constipation unless directed by prescriber not to
- **Pain:** Monitor characteristics of pain, this product does not effect analgesics
- **Beers:** Avoid in older adults unless safer alternatives are not available, may cause ataxia, impaired psychomotor function

• **Opioid withdrawal:** Teach patient to report severe diarrhea, abdominal pain, chills

### Patient/family education

• Teach patient that after 30 min, toilet facilities should be nearby, bowel relaxation occurs, not to use more than one dose in 24 hr
• Advise patient to notify prescriber of abdominal pain, continuous or severe diarrhea, nausea or vomiting
• Teach patient to avoid use in pregnancy unless absolutely necessary; avoid in breastfeeding

### Evaluation

**Positive therapeutic outcome**
• Decreased constipation

## methylphenidate (Rx)

(meth-ill-fen'i-date)
**Biphentin, Concerta, Daytrana, Methidate, Methylin, QuillChew, Quillivant XR, Ritalin, Ritalin LA, Ritalin SR**
*Func. class.:* Cerebral stimulant
*Chem. class.:* Piperidine derivative
**Controlled substance schedule II**

**Do not confuse:** methylphenidate/methadone, Metadate ER/methadone, Ritalin/Ritalin LA/ritodrine

**ACTION:** Increases release of norepinephrine and dopamine in cerebral cortex to reticular activating system; exact action not known

**Therapeutic outcome:** Increased alertness, decreased fatigue, ability to stay awake (narcolepsy), increased attention span, decreased hyperactivity (ADHD)

**USES:** Attention deficit disorder with hyperactivity (ADHD), narcolepsy (except Concerta, Metadate CD, Ritalin LA), attention deficit disorder (ADD)

## CONTRAINDICATIONS

Hypersensitivity, anxiety, history of Tourette's syndrome, glaucoma, hereditary fructose intolerance, glaucoma

**Precautions:** Pregnancy, breastfeeding, hypertension, depression, seizures, abrupt discontinuation, acute MI, aortic stenosis, arteriosclerosis, bipolar disorder, cardiac dysrhythmias, cardiomyopathy, chemical leukoderma, child depression, dysphagia, esophageal stricture, growth inhibition, heart failure, hepatic disease, hyperthyroidism, ileus, mania, peripheral vascular disease, PKU, psychosis, Raynaud's, schizophrenia, stroke, suicidal ideation, visual disturbances

**BLACK BOX WARNING:** Substance abuse, alcoholism

## DOSAGE AND ROUTES

### Attention-deficit/hyperactivity disorder (ADHD) initial treatment (not currently on methylphenidate)

#### >> Regular release: Ritalin, Methylin, Methylin oral sol, Methylin chew tabs

**Adult: PO** 20-30 mg/day, range 10-60 mg/day in 2-3 divided doses, 30-45 min before meals
**Child ≥6 yr: PO** 5 mg bid initially, increase 5-10 mg/day qwk, usual dose 0.3-2 mg/kg/day, max 60 mg/day

#### >> Extended release: Ritalin SR, Metadate ER, Methylin ER

**Adult/adolescent/child ≥6 yr: PO** max 20-30 mg tid

#### >> Extended-release once-daily tabs: Concerta

**Adult: PO** 18-36 mg/day initially, then adjust by 18 mg q wk, max 72 mg/day
**Adolescent: PO** 18 mg/day initially, then adjust by 18 mg q wk, max 72 mg/day
**Child ≥6 yr: PO** 18 mg/day initially, then adjust by 18 mg q wk, max 54 mg/day

#### >> Extended-release once-daily capsules: Ritalin LA

**Adult/adolescent/child ≥6 yr: PO** 10-20 mg/day in AM initially, adjust by 10 mg qwk, max 60 mg/day

#### >> Transdermal: Daytrana

**Adolescent/child ≥6 yr: TD** wk 1: 10 mg/day (9-hr patch); wk 2: 15 mg/day (9-hr patch); wk 3: 20 mg/day (9-hr patch); wk 4: 30 mg/day (9-hr patch)

### Conversion to once-daily from other forms for ADHD

#### >> Extended-release once-daily capsules: Ritalin LA

**Adult/adolescent/child ≥6 yr: PO** give no more than total daily dose of other forms, may adjust by 10 mg qwk, max 60 mg/day

#### >> Extended-release once-daily tablets: Concerta

**Adult/adolescent/child ≥6 yr (currently receiving 10-15 mg/day): PO** 18 mg q AM initially, adjust by 18 mg qwk, max 72 mg/day (adult); max 72 mg/day, 2 mg/kg/day (adolescent); 54 mg/day (child)
**Adult/adolescent/child ≥6 yr (currently receiving 20-30 mg/day): PO** 36 mg q AM, adjust by 18 mg qwk, max 72 mg/day (adult); 72 mg/day, 2 mg/kg/day (adolescent); 54 mg/day (child)

**Adult/adolescent/child ≥6 yr (currently receiving 30-45 mg/day): PO** 54 mg q AM, adjust by 18 mg qwk, max 72 mg/day (adult); 72 mg/day, 2 mg/kg/day (adolescent); 54 mg/day (child)
**Adult/adolescent/child ≥6 yr (currently receiving 40-60 mg/day): PO** 72 mg q AM, 72 mg/day

### >> Extended-release once daily tabs: Quillivant XR

**Child > 6 yr/adolescent: PO** 20 mg/day in AM, may increase by 10-20 mg qwk

### >> Transdermal: Daytrana

**Adolescent and child ≥6 yr: TD** wk 1: 10 mg/day (9-hr patch); wk 2: 15 mg/day (9-hr patch); wk 3: 20 mg/day (9-hr patch); wk 4: 30 mg/day (9-hr patch)

## Narcolepsy

### >> Immediate release: Ritalin, Methylin oral sol, Methylin chew tabs

**Adult: PO** 20-30 mg/day, range 10-60 mg/day in 2-3 divided doses
**Child ≥6 yr: PO** 5 mg bid, may increase by 5-10 mg qwk, max 60 mg/day

### >> Extended-release tabs: Ritalin SR, Metadate ER

**Adult/adolescent/child ≥6 yr: PO** max 20 mg tid

## Poststroke depression; major depression (unlabeled)

**Adult and geriatric: PO** (immediate rel tabs) 2.5 mg bid morning/noon, may increase by 2.5-5 mg q2-3days

**Available forms:** Tabs 5, 10, 20 mg; ext rel tabs 10, 20, mg; ext rel tabs (Concerta) 18, 27, 36, 54 mg; ext rel caps 10, 20, 30, 40 mg; oral sol 5 mg, 10 mg/ml; chew tabs (Methylin) 2.5, 5, 10 mg; transdermal patch 12.5 $cm^2$ (10 mg), 18.75 $cm^2$ (15 mg), 25 $cm^2$ (20 mg), 37.5 $cm^2$ (30 mg)

## Implementation

**PO route**

- **Methylin chewable tablets:** Give with at least 8 oz of fluid to avoid choking
- **Immediate-release dosage forms (Ritalin, Methylin, Metadate, generic equivalents):** Give 30 to 45 min before meal; depending on the patient's needs, twice-daily dosages may be used in the morning and around noon. Individualized timing of the midday dose is usually necessary, as determined by the loss of positive drug effect, which occurs in a range of 2 to 6 hr after the AM dose
- **Extended-release tablets (Ritalin SR, Metadate ER, generic methylphenidate ER):** May be given without regard to meals. Give whole; do not cut, crush, or chew. Give the last dose of the day several hours before bedtime. Extended-release tablets may be used when the determined 8-hr dose of immediate-release methylphenidate tablets equals the 8-hr dosage of the extended-release tablets
- **Once-daily extended-release tablets (Concerta):** May be given without regard to meals. Give whole; do not cut, crush, or chew; a portion of this tablet may appear intact in the stool; this is normal
- **Once-daily extended-release capsules (Ritalin LA, Aptensio XR):** May be given without regard to meals; however, patients should establish a routine pattern with regard to meals. Give with an adequate amount of fluid. Do not cut, crush, or chew. If swallowing is difficult, capsule may be opened and the contents sprinkled on one Tbsp of applesauce and swallowed immediately. The capsule contents (beads) should not be crushed or chewed. Instruct the patient to drink fluids (water, milk, or juice) after taking sprinkles with applesauce
- **Once-daily extended-release chewable tablets (QuilliChew ER):** Give qday in the morning with or without food. The tablet may be broken in half for 10-mg and 15-mg doses
- **Once-daily extended-release orally disintegrating tablets (Cotempla XR-ODT):** Give qday in the morning consistently either with or without food. Do not remove tablet from the blister pack until just before use; use dry hands when opening the blister pack. Remove the tablet by peeling back the foil; do not push the tablet through the foil. Place the whole tablet on the tongue and allow it to disintegrate without chewing or crushing. No liquid is needed

**Immediate-release oral solution (Methylin)**

- Measure dose with an oral syringe or calibrated measuring device
- Give 30 to 45 min before meals in divided doses two to three times/day. Twice-daily dosages may be administered in the morning and around noon. Individualized timing of the midday dose is usually necessary, as determined by the loss of positive drug effect, which occurs 2 to 6 hr after the morning dose. Give the last dose of the day before 6 PM

**Once-daily extended-release oral suspension (Quillivant XR)**

- Vigorously shake before use, measure dose with the calibrated oral dosing dispenser provided
- Give in the morning without regard to meals

**Reconstitution of once-daily extended-release oral suspension (Quillivant XR)**
• Review the manufacturer's reconstitution instructions for the particular product and package size
• Before reconstitution, tap the bottle several times to loosen the powder
• To prepare the suspension, add the specified amount of water to the bottle, fully insert the bottle adapter into the bottle neck, replace the cap, and vigorously shake the bottle for at least 10 sec
• **Storage:** Store reconstituted suspension at 77° F; dispense in original packaging (bottle in container). The reconstituted suspension is stable for 4 mo from date of reconstitution

**Topical route**

**Daytrana transdermal system:**
• Patch should be applied 2 hr before the effect is needed
• Do not cut or trim patch
• Apply patch immediately after opening the pouch and removing protective liner. Do not use if pouch seal is broken. Do not touch the adhesive side of the patch during application to avoid absorption. Wash hands immediately if adhesive side of the patch is touched. Discard the patch if difficulty is encountered in separating the patch from the release liner or if tearing or other damage occurs. Discard patch if adhesive containing medication has transferred to the liner during removal of the patch from the liner
• Place on a dry, clean area of the hip and hold in place for 30 sec with the palm of the hand. Do not apply to oily, damaged, or irritated skin. Do not apply topical preparations to the application site immediately before patch application. Avoid the waistline area where the patch could be rubbed by clothing
• Applications sites should be alternated from one hip to the next each day, avoiding sites where a patch was recently placed, when possible
• Instruct patient on proper application and disposal of patch. Adherence of the patch may be affected by showering, bathing, or swimming. The carton contains an administration chart that can help the patient monitor application and removal time, which the patient and/or caregiver should be encouraged to use. If a patch was removed without the caregiver's knowledge, or if a patch is missing from the tray, the caregiver should be encouraged to ask the child when and how the patch was removed
• Avoid exposing the application site to hair dryers, heating pads, electric blankets, heated water beds, or other direct external heat sources. The rate and extent of absorption of methylphenidate are significantly increased during application of heat to the patch during use. Temperature-dependent increases in absorption may be greater than twofold, potentially resulting in overdose
• Do not apply or reapply the patch with dressings, tape, or adhesives. If the patch is not fully adhered to the skin during application or wear time, discard the patch according to disposal instructions and apply a new patch
• The total daily wear time should not exceed 9 hr, regardless of patch replacement
• Patches should be peeled off slowly. Patch removal may be aided by applying an oil-based product (petroleum jelly, mineral oil, olive oil) to the patch edges and gently working the oil underneath the edges of the patch
• **Disposal:** Instruct patient and/or caregiver to fold used patches so that the adhesive side of the patch adheres to itself, and then flush it down the toilet or dispose of in an appropriate lidded container. If the patient stops using the prescription, each unused patch should be removed from its pouch, separated from the protective liner, folded onto itself, and flushed down the toilet or disposed of in an appropriate lidded container. Do not flush pouch and protective liner down the toilet. Instead, dispose of them in an appropriate container with a lid



## ADVERSE EFFECTS

**CNS:** *Hyperactivity, insomnia, restlessness, talkativeness,* dizziness, headache, akathisia, dyskinesia, masking or worsening of Tourette's syndrome, seizures, drowsiness, toxic psychosis, hallucinations, neuroleptic malignant syndrome, aggression, cerebral vasculitis, hemorrhage, stroke (rare)
**CV:** *Palpitations, tachycardia,* B/P changes, angina, dysrhythmias, sudden death
**ENDO:** Growth retardation
**GI:** Nausea, anorexia, dry mouth, weight loss, abdominal pain
**HEMA:** Leukopenia, anemia, thrombocytopenic purpura
**INTEG:** Exfoliative dermatitis, urticaria, rash, erythema multiforme, hypersensitivity reactions; patch: permanent loss of skin color, anaphylaxis, angioedema
**MISC:** Fever, arthralgia, scalp hair loss, rhabdomyolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO); delayed (ext rel) |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | 1-3 hr |

### Pharmacodynamics

| | PO | PO–ext rel |
|---|---|---|
| **Onset** | Varies with formulation | 2 hr |
| **Peak** | 1-3 hr | 4 hr |
| **Duration** | | 6-8 hr |

## INTERACTIONS

### Individual drugs

Guanethidine: decreased effect of guanethidine

### Drug classifications

Anticonvulsants, antidepressants (tricyclics), SNRIs, CNS stimulants, selective serotonin reuptake inhibitors (SSRIs): increased effects, monitor for adverse effects

MAOIs (or within 14 days of MAOIs), vasopressors: increased hypertensive crisis

Antihypertensives: decreased effects of antihypertensives

### Drug/herb

Cola nut, guarana, horsetail, yerba maté, yohimbe: increased CNS stimulation

Melatonin: synergistic effect

### Drug/food

Caffeine: increased stimulation

## NURSING CONSIDERATIONS

### Assessment

- **ADHD:** In children or adults with ADHD, monitor for improved organizational skills, attention span, attending to tasks, impulse control, socialization, and ability to get along better with others

**BLACK BOX WARNING: Substance abuse:** there is a high potential for abuse, use caution in those with history of substance abuse

- Monitor VS, B/P, since this product may reverse antihypertensives; check patients with cardiac disease more often for increased B/P
- Perform CBC, urinalysis; for diabetic patients monitor blood glucose, urine glucose; insulin changes may be required, since eating will decrease, but decreased growth will resume when product is discontinued
- Monitor height and weight q3mo since growth rate in children may be decreased; appetite is suppressed, weight loss is common during the first few mo of treatment
- Monitor mental status: mood, sensorium, affect, stimulation, insomnia; aggressiveness may occur; depression with crying spells may occur after product has worn off, may produce euphoria, rebound depression after product wears off
- Assess for tolerance; should not be used for extended time except in ADHD; dosage should be discontinued gradually to prevent withdrawal symptoms
- Assess for narcoleptic symptoms before medication and after; ability to stay awake should increase significantly
- **Assess for withdrawal symptoms:** headache, nausea, vomiting, muscle pain, weakness; product tolerance will develop after long-term use; dosage should not be increased if tolerance develops, usually not associated with drug holidays
- Assess appetite, sleep, speech patterns
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, no well-controlled studies, cautious use in breastfeeding
- **Beers:** Avoid use in older adults, CNS stimulant effects
- Skin pigmentation when using TD product, may cause loss of pigmentation around site

### Patient/family education

- **Seizures: Those with seizure disorder may have lower seizure threshold**
- Teach patient to decrease caffeine consumption (coffee, tea, cola, chocolate); not to use guarana, cola nut, yerba maté, which may increase irritability and stimulation; to avoid OTC preparations unless approved by prescriber; to avoid alcohol ingestion; these may cause serious product interactions, to always use dosing dispenser provided for oral suspension dose
- Advise patient to taper off product over several wk, or depression, increased sleeping, lethargy may occur
- Notify prescriber if skin irritation or rash occurs if patch comes off, use a new one on a different skin site, tell child not to remove or share with others
- Instruct patient not to double doses if medication is missed; prescriber may suggest product holidays (ADHD) during the school year to assess progress and determine continued product necessity
- Instruct patient/family to notify prescriber if significant side effects occur: tremors, insomnia, palpitations, restlessness; product changes may be needed

- Inform patient that if dry mouth occurs to use frequent sips of water, sugarless gum, hard candy during beginning therapy; dry mouth lessens with continued treatment
- Encourage patient to get needed rest; patient will feel more tired at end of day; to take last dose at least 6 hr before bedtime to avoid insomnia
- Advise patient that shell of Concerta tab may appear in stools

### Evaluation

**Positive therapeutic outcome**
- Decreased hyperactivity in ADHD
- Improved attention span in ADHD
- Absence of sleeping during day in narcolepsy

## TREATMENT OF OVERDOSE:
Administer fluids, hemodialysis, peritoneal dialysis, antihypertensives for increased B/P; administer short-acting barbiturate before lavage

## methylPREDNISolone (Rx)
(meth-ill-pred-niss′oh-lone)
**A-Methapred, Depo-Medrol, Medrol, Solu-MEDROL**
*Func. class.:* Corticosteroid, synthetic
*Chem. class.:* Glucocorticoid, immediate acting

**Do not confuse:** methylPREDNISolone/medroxyPROGESTERone/predniSONE/methylTESTOSTERone/predniSONE/Methylprednisone

**ACTION:** Decreases inflammation by suppression of migration of polymorphonuclear leukocytes, fibroblasts; reverses increased capillary permeability and lysosomal stabilization

**Therapeutic outcome:** Decreased inflammation

**USES:** Severe inflammation, shock, adrenal insufficiency, collagen disorders, management of acute spinal cord injury, multiple sclerosis

## CONTRAINDICATIONS
Hypersensitivity, intrathecal use, neonates

**Precautions:** Pregnancy, breastfeeding, diabetes mellitus, glaucoma, osteoporosis, seizure disorders, ulcerative colitis, HF, myasthenia gravis, renal disease, esophagitis, peptic ulcer; tartrazine, benzyl alcohol, corticosteroid hypersensitivity; viral infection, TB, traumatic brain injury, Cushing's syndrome, measles, varicella, fungal infections

## DOSAGE AND ROUTES
### Adrenal insufficiency/inflammation
**Adult:** PO 4-48 mg in 4 divided doses; IM 10-120 mg (acetate); IM/**IV** 10-40 mg (succinate); intraarticular 4-80 mg (acetate)
**Child:** **IV** 0.5-1.7 mg/kg in 3-4 divided doses (succinate)

### Multiple sclerosis
**Adult:** PO 160 mg/day × 1 wk, then 64 mg every other day × 30 days

**Available forms:** Tabs 2, 4, 6, 8, 16, 32 mg; inj 20, 40, 80 mg/ml acetate; inj 40, 125, 500, 1000, 2000 mg/vial succinate

### Implementation
**PO route**
- Give with food or milk to decrease GI symptoms
- Single daily dose should be given in AM to coincide with body's normal cortisol secretion

**IM route**
- Give IM inj deep in large muscle mass; rotate sites; avoid deltoid; use 21-G needle; injection site reaction may occur (induration, pain at site, atrophy)
- Give in one dose in AM to prevent adrenal suppression; avoid SUBCUT administration; may damage tissue

**IV route**
- Use only methylPREDNISolone sodium succinate (Solu-MEDROL) IV, never use methylPREDNISolone acetate suspension IV
- Give after diluting with provided diluent, agitate slowly; give directly over 3-15 min; doses ≥2 mg/kg or 250 mg should be given by intermittent IV infusion unless potential benefits outweigh potential risks

**Intermittent/continuous IV infusion route**
- Dilute further in $D_5W$, 0.9% NaCl, $D_5NS$, haze may form, give over 15-60 min, large doses (≥500 mg) give over 30-60 min
- Give after shaking susp (parenteral)
- Give titrated dosage; use lowest effective dosage

**Y-site compatibilities:** Acetaminophen, acyclovir, amifostine, aztreonam, cefepime, CISplatin, cladribine, cyclophosphamide, cytarabine, DOPamine, DOXOrubicin, enalaprilat, famotidine, fludarabine, granisetron, heparin, inamrinone, melphalan, meperidine, methotrexate, metroNIDAZOLE, midazolam, morphine, piperacillin/tazobactam, sodium bicarbonate, tacrolimus, teniposide, theophylline, thiotepa, vit B with C

**Y-site incompatibilities:** Ondansetron, PACLitaxel, sargramostim, vinorelbine

**Inhalation route**

- Give inh with water to decrease possibility of fungal infections
- Give titrated dosage; use lowest effective dosage
- Clean aerosol topically daily with warm water; dry thoroughly
- Store in cool environment; do not puncture or incinerate container

**Topical route**

- Cleanse area before applying product
- Apply only to affected areas; do not get in eyes
- Apply medication, then cover with occlusive dressing (only if prescribed); seal to normal skin; change q12hr; systemic absorption may occur
- Apply only to dermatoses; do not use on weeping, denuded, or infected area
- Apply treatment for a few days after area has cleared
- Store at room temperature

## ADVERSE EFFECTS

**CNS:** Depression, flushing, sweating, headache, mood changes
**CV:** Hypertension, circulatory collapse, thrombophlebitis, embolism, tachycardia
**EENT:** Fungal infections, increased intraocular pressure, blurred vision, cataracts
**GI:** Diarrhea, nausea, abdominal distention, GI hemorrhage, increased appetite, pancreatitis
**HEMA:** Thrombocytopenia
**INTEG:** Acne, poor wound healing, ecchymosis, petechiae
**MS:** Fractures, osteoporosis, weakness

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO); systemic (topical) |
| **Distribution** | Crosses placenta |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidney |
| **Half-life** | 3-5 hr (plasma) 18-36 hr (tissue); adrenal suppression 3-4 days |

### Pharmacodynamics

| | PO | IM | IV | Topical |
|---|---|---|---|---|
| **Onset** | Unknown | Unknown | Rapid | Min to hr |
| **Peak** | 2 hr | 4-8 days | Unknown | Hr to days |
| **Duration** | 1½ days | 1-4 wk | Unknown | Hr to days |

## INTERACTIONS

### Individual drugs

Amphotericin B: increased side effects
Insulin: increased need for insulin
Phenytoin, rifampin: decreased action; increased metabolism
Somatrem: decreased effect

### Drug classifications

Contraceptives, oral: increased methylPREDNISolone action
CYP3A4 inducers (barbiturates, bosentan, carBAMazepine, efavirenz, phenytoins, nevirapine, rifabutin, rifampin): decreased methylPREDNISolone effect
CYP3A4 inhibitors (aprepitant, antiretroviral protease inhibitors, clarithromycin, danazol, delavirdine, diltiazem, erythromycin, fluconazole, FLUoxetine, fluvoxaMINE, imatinib, ketoconazole, mibefradil, nefazodone, telithromycin, voriconazole): increased adrenal suppression
Diuretics: increased side effects
Hypoglycemic agents: increased need for hypoglycemic agents
Vaccines: decreased effects of vaccines

### Drug/herb

St. John's wort: avoid use

### Drug/food

Grapefruit juice: increased methylPREDNISolone level; do not use concurrently

### Drug/lab test

Increased: cholesterol, blood glucose
Decreased: calcium, potassium, $T_4$, $T_3$, thyroid radioactive iodine uptake test, urine 17-OHCS, 17-KS
False negative: skin allergy tests

## NURSING CONSIDERATIONS

### Assessment

- **Adrenal insufficiency:** assess for weight loss, nausea, vomiting, confusion, anxiety, hypotension, weakness
- Monitor plasma cortisol levels during long-term therapy (normal level 138-635 nmol/L when drawn at 8 AM)
- Monitor potassium, blood glucose, urine glucose while patient is on long-term therapy; hypokalemia and hyperglycemia
- Monitor weight daily; notify prescriber of weekly gain >5 lb
- Monitor B/P q4hr, pulse; notify prescriber if chest pain occurs
- Monitor I&O ratio; be alert for decreasing urinary output and increasing edema
- Monitor adrenal function periodically for hypothalamic-pituitary-adrenal axis suppression

• **Assess for infection:** increased temp, WBC even after withdrawal of medication; product masks infection symptoms
• Assess for potassium depletion: paresthesias, fatigue, nausea, vomiting, depression, polyuria, dysrhythmias, weakness
• Assess for edema, hypertension, cardiac symptoms
• Assess mental status: affect, mood, behavioral changes, aggression
• Check temp; if fever develops, product should be discontinued
• Assess for systemic absorption: increased temp, inflammation, irritation (topical)

### Patient/family education

• Teach patient that emergency ID as corticosteroid user should be carried/worn
• Advise patient to notify prescriber if therapeutic response decreases; dosage adjustment may be needed
• Caution patient not to discontinue abruptly; adrenal crisis can result
• Teach patient to take PO with food, milk, to decrease GI symptoms
• Caution patient to avoid OTC products: salicylates, alcohol in cough products, cold preparations unless directed by prescriber
• Teach patient all aspects of product use including cushingoid symptoms
• Teach patient symptoms of **adrenal insufficiency:** nausea, anorexia, fatigue, dizziness, dyspnea, weakness, joint pain
• Inform patient that long-term therapy may be needed to clear infection (1-2 mo depending on type of infection)

**Nasal route**

• Advise patient to clear nasal passages if sneezing attack occurs; repeat dose
• Advise patient to continue using product even if mild nasal bleeding occurs; is usually transient
• Teach patient method of instillation after providing written instructions from manufacturer
• Teach patient to recognize **cushingoid symptoms:** buffalo hump, moon face, rapid weight gain, excess sweating
• **Beers:** Avoid in older adults with or at high risk for delirium, assess for confusion, delirium frequently
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed, excreted in breast milk
• **Infection:** Teach patient to avoid persons with known infections; corticosteroids can mask symptoms of infection

**Topical route**

• Advise patient to avoid sunlight on affected area; burns may occur

### Evaluation

**Positive therapeutic outcome**

• Ease of respirations, decreased inflammation
• Absence of severe itching, patches on skin, flaking (top)

## metipranolol ophthalmic

*See Appendix B*

## metoclopramide (Rx)

(met-oh-kloe-pra′mide)
**Apo-Metoclop** 🍁, **Metozolv ODT, Reglan**
*Func. class.:* Cholinergic, antiemetic
*Chem. class.:* Central dopamine receptor antagonist

**Do not confuse:** **metoclopramide**/metolazone, **Reglan**/Megace/Renagel

**ACTION:** Enhances response to acetylcholine of tissue in upper GI tract, which causes contraction of gastric muscle, relaxes pyloric, duodenal segments, increases peristalsis without stimulating secretions, blocks dopamine in chemoreceptor trigger zone of CNS

**Therapeutic outcome:** Decreased symptoms of delayed gastric emptying, decreased nausea, vomiting

**USES:** Prevention of nausea, vomiting induced by chemotherapy, radiation; delayed gastric emptying, gastroesophageal reflux

### CONTRAINDICATIONS

Hypersensitivity to this product or procaine or procainamide, seizure disorder, pheochromocytoma, GI obstruction

**Precautions:** Pregnancy, breastfeeding, GI hemorrhage, Parkinson's disease, abrupt discontinuation, cardiac disease, children, depression, diabetes mellitus, G6PD deficiency, geriatrics, heart failure, hypertension, infertility, malignant hyperthermia, methemoglobinemia, procainamide/paraben hypersensitivity, renal impairment, breast cancer (prolactin dependent)

**BLACK BOX WARNING:** Tardive dyskinesia

### DOSAGE AND ROUTES

**Nausea/vomiting (chemotherapy)**

**Adult: IV** 1-2 mg/kg 30 min before administration of chemotherapy, then q2hr × 2 doses, then q3hr × 3 doses
**Child (unlabeled): IV** 1-2 mg/kg/dose

### Facilitation of small bowel intubation in radiologic exams

**Adult and child >14 yr:** **IV** 10 mg over 1-2 min
**Child 6-14 yr:** **IV** 2.5-5 mg
**Child <6 yr:** **IV** 0.1 mg/kg

### Diabetic gastroparesis

**Adult:** PO 10 mg 30 min before meals, at bedtime × 2-8 wk
**Geriatric:** PO 5 mg ½ hr before meals, at bedtime, increase to 10 mg if needed

### Gastroesophageal reflux

**Adult:** PO 10-15 mg qid 30 min before meals and at bedtime
**Child:** PO 0.4-0.8 mg/kg/day divided in 4 doses

### Renal dose

**Adult: PO/IV CCr** ≥40 ml/min, no change; CCr <40 ml/min: Reduce initial recommended dose by 50%. Thereafter dose may be increased or decreased as needed or CCr >50 ml/min: Give 100% of the normal dose; CCr 10 to 50 ml/min: Give 75% of the normal dose; CCr <10 ml/min: Give 50% of the normal dose
**Child:** PO/IV CCr 30 to 50 ml/min: Give 75% of the normal dose; CCr 10 to 29 ml/min: Give 50% of the normal dose; CCr <10 ml/min: Give 25% of the normal dose

**Available forms:** Tabs 5, 10 mg; syr 5 mg/5 ml; inj 5 mg/ml; orally disintegrating tab 5, 10 mg; oral sol 5 mg/5 ml

### Implementation

**PO route**
- Use gum, hard candy, frequent rinsing of mouth for dryness of oral cavity
- Give ½-1 hr before meals for better absorption
- **Oral disintegrating:** place on tongue, allow to dissolve, swallow, remove from bottle immediately before use

**IM route**
- Give for postop nausea and vomiting before end of surgery

**Direct IV route**
- Give **IV** undiluted if dose is ≤10 mg; give over 2 min
- Give diphenhydrAMINE **IV** or benztropine IM for EPS
- Discard open ampules

**Intermittent IV infusion route**
- Dilute more than 10 mg in 50 ml or more $D_5W$, NaCl, Ringer's, LR and give over 15 min or more

**Y-site compatibilities:** Acetaminophen, acyclovir, aldesleukin, alfentanil, amifostine, amikacin, aminophylline, ascorbic acid, atracurium, atropine, azaTHIOprine, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, ceFAZolin, cefonicid, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, cladribine, clindamycin, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doripenem, doxapram, DOXOrubicin hydrochloride, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, epoetin alfa, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, folic acid, foscarnet, gallium nitrate, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, IDArubicin, ifosfamide, imipenem/cilastatin, indomethacin, insulin, isoproterenol, ketorolac, labetalol, leucovorin, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, meropenem, metaraminol, methadone, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoprolol, metroNIDAZOLE, miconazole, midazolam, milrinone, minocycline, mitoMYcin, morphine, moxalactam, multiple vitamins, nafcillin, nalbuphine, naloxone, nesiritide, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pantoprazole, papaverine, PEMEtrexed, penicillin G, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, phytonadione, piperacillin/tazobactam, potassium chloride, procainamide, prochlorperazine, promethazine, propranolol, protamine, pyridoxine, quinupristin/dalfopristin, ranitidine, remifentanil, riTUXimab, rocuronium, sargramostim, sodium acetate/bicarbonate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin/clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, topotecan, trastuzumab, trimethaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, voriconazole, zidovudine

**Y-site incompatibilities:** Amphotericin B cholesteryl/colloidal, amphotericin B liposome,

amsacrine, cefepime, dantrolene, diazepam, diazoxide, DOXOrubicin liposome, ganciclovir, inamrinone, phenytoin, propofol, trimethoprim/sulfamethoxazole

## ADVERSE EFFECTS

**CNS:** *Sedation, fatigue, restlessness, headache, sleeplessness, dystonia,* dizziness, drowsiness, suicidal ideation, seizures, EPS, neuroleptic malignant syndrome; tardive dyskinesia (>3 mo, high doses)
**CV:** Hypotension, supraventricular tachycardia
**GI:** Dry mouth, constipation, nausea, anorexia, vomiting, diarrhea
**GU:** Decreased libido, prolactin secretion, amenorrhea, galactorrhea
**HEMA:** Neutropenia, leukopenia, agranulocytosis
**INTEG:** Urticaria, rash

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO) |
| **Distribution** | Widely distributed; crosses blood-brain barrier, placenta |
| **Metabolism** | Liver, minimally |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 2.5-6 hr |

### Pharmacodynamics

| | PO | IM | IV |
|---|---|---|---|
| **Onset** | ½-1 hr | 10-15 min | 1-3 min |
| **Peak** | Unknown | Unknown | Unknown |
| **Duration** | 1-2 hr | 1-2 hr | 1-2 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased sedation
Haloperidol: increased extrapyramidal reaction

### Drug classifications

Anticholinergics, opiates: decreased action of metoclopramide
CNS depressants: increased sedation
MAOIs: avoid use
Phenothiazines: increased extrapyramidal reaction

### Drug/lab test

Increased: prolactin, aldosterone, thyrotropin

## NURSING CONSIDERATIONS

### Assessment

- Assess GI complaints: nausea, vomiting, anorexia, constipation, abdominal distention before, after administration

**BLACK BOX WARNING: Assess for EPS and tardive dyskinesia** (more likely to occur in treatment >3 mo, geriatric): rigidity, grimacing, shuffling gait, tremors, rhythmic involuntary movements of tongue, mouth, jaw, feet, hands; these side effects should be reported to prescriber immediately; some effects may be irreversible; assess for involuntary movements frequently

- Assess mental status: depression, anxiety, irritability during treatment
- **Neuroleptic malignant syndrome:** assess for hyperthermia, change in B/P, pulse, tachycardia, sweating, rigidity, altered consciousness
- **Pregnancy/breastfeeding:** Use only if clearly needed, do not breastfeed, excreted in breast milk
- **Beers:** Avoid in older adults unless for gastroparesis, can cause extrapyramidal effects, monitor for EPS frequently

### Patient/family education

- Instruct patient to avoid driving, other hazardous activities until stabilized on this medication
- Advise patient to avoid alcohol and other CNS depressants that enhance sedating properties of this product
- Advise patient to notify prescriber if involuntary movements occur

### Evaluation

**Positive therapeutic outcome**

- Absence of nausea, vomiting, anorexia, fullness

## metolazone (Rx)

(me-tole'a-zone)
Func. class.: Diuretic, antihypertensive
*Chem. class.:* Thiazide-like quinazoline derivative

**Do not confuse:** metolazone/methotrexate/metoclopramide

**ACTION:** Acts on the distal tubule and cortical thick ascending limb of the loop of Henle in the kidney, increasing excretion of sodium, water, chloride, magnesium, potassium, and bicarbonate, decreases GFR

**Therapeutic outcome:** Decreased B/P, decreased edema in lung tissue and peripherally

**USES:** Edema, hypertension

## CONTRAINDICATIONS

Pregnancy (preeclampsia, intrauterine growth retardation), hypersensitivity to thiazides or

sulfonamides, anuria, coma, hepatic encephalopathy

**Precautions:** Pregnancy, breastfeeding, geriatric, hypokalemia, renal/hepatic disease, gout, COPD, lupus erythematosus, diabetes mellitus, hypotension, history of pancreatitis, hypersensitivity to sulfonamides, thiazides, electrolyte imbalance

## DOSAGE AND ROUTES

### Edema

**Adult:** PO 5-10 mg/day; max 20 mg/day

### Hypertension

**Adult:** PO 2.5-5 mg/day
**Child:** PO 0.2-0.4 mg/kg/day in divided doses q12-24hr

**Available forms:** Tabs 2.5, 5, 10 mg

### Implementation

- Give in AM to avoid interference with sleep
- Provide potassium replacement if potassium level is 3.0; product may be crushed if patient is unable to swallow
- Give with food; if nausea occurs, absorption may be increased

## ADVERSE EFFECTS

**CNS:** drowsiness, lethargy
**CV:** *Orthostatic hypotension,* palpitations, chest pain, hypotension
**ELECT:** *Hypokalemia,* hypercalcemia, hyponatremia
**GI:** *Nausea, vomiting, anorexia,* constipation, diarrhea, cramps, pancreatitis, GI irritation, dry mouth, jaundice, hepatitis
**GU:** *Frequency,* polyuria, uremia, glucosuria, nocturia, impotence, *hyperuricemia*
**HEMA:** Aplastic anemia, hemolytic anemia, leukopenia, agranulocytosis, neutropenia
**INTEG:** *Rash,* urticaria, purpura, photosensitivity, fever, dry skin, toxic epidermal necrolysis, Stevens-Johnson syndrome
**META:** *Hyperglycemia,* increased creatinine, BUN
**MS:** Muscle cramps, joint pain, swelling

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | GI tract (10%-20%) |
| **Distribution** | Crosses placenta; protein binding 33% |
| **Metabolism** | Urine, unchanged |
| **Excretion** | Breast milk |
| **Half-life** | 8 hr (extended); 14 hr (prompt) |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 8 hr |
| **Duration** | 12-24 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased hypotension (large amounts)
Amphotericin B, digoxin, mezlocillin, piperacillin: increased hypokalemia
Lithium: increased toxicity

### Drug classifications

Antidiabetics: increased hyperglycemia
Antihypertensives: increased antihypertensive effect
Barbiturates, nitrates, opioids: increased hypotension
Diuretics (loop): increased metolazone effect
Glucocorticoids, laxatives (stimulant): increased hypokalemia
NSAIDs, salicylates: decreased action of metolazone

### Drug/food

Licorice: increased severe hypokalemia

### Drug/herb

Ephedra (ma huang): decreased antihypertensive effect
Hawthorn: increased antihypertensive effect

### Drug/lab test

Increased: calcium, cholesterol, glucose, triglycerides
Decreased: potassium, sodium, chloride, magnesium

## NURSING CONSIDERATIONS

### Assessment

- **Hypertension:** assess B/P before, during therapy with patient lying, standing, and sitting as appropriate; orthostatic hypotension can occur rapidly
- Monitor blood glucose if patient is diabetic
- **HF:** assess for improvement in feet, legs, sacral area daily if medication is being used
- Check for rashes, temp elevation daily
- Monitor patients receiving cardiac glycosides for increased hypokalemia
- **Hypokalemia:** assess for postural hypotension, malaise, fatigue, tachycardia, leg cramps, weakness

**BLACK BOX WARNING:** Hepatic encephalopathy: do not use in hepatic coma or precoma, fluctuations in electrolytes can occur rapidly and precipitate hepatic coma, use caution in those with impaired hepatic function

• Assess and record fluid volume status: I&O ratios; monitor weight, distended red veins, crackles in lung, color, quality, and specific gravity of urine; skin turgor, adequacy of pulses, moist mucous membranes, bilateral lung sounds, peripheral pitting edema; dehydration symptoms of decreasing output, thirst, hypotension, dry mouth and mucous membranes should be reported
• Monitor electrolytes: potassium, sodium, calcium, magnesium; also include BUN, blood pH, ABGs, uric acid, CBC, blood glucose
• **Pregnancy/breastfeeding:** Use in pregnancy only if needed, do not breastfeed, excreted in breast milk
• **Beers:** Use with caution in older adults, may exacerbate or cause SIADH, monitor sodium level frequently

### Patient/family education

• Teach patient to take the medication early in the day to prevent nocturia
• Instruct patient to take with food or milk if GI symptoms of nausea and anorexia occur
• Teach patient to maintain a weekly record of weight and notify prescriber of weight loss >5 lb
• Caution patient that this product causes a loss of potassium, so foods rich in potassium should be added to the diet; refer to a dietitian for assistance in planning
• Caution the patient to rise slowly from sitting or reclining positions, not to exercise in hot weather or stand for prolonged periods, since orthostatic hypotension will be enhanced; lie down if dizziness occurs
• Teach patient not to use alcohol or any OTC medications without prescriber's approval; serious product reactions may occur
• Emphasize the need to contact prescriber immediately if muscle cramps, weakness, nausea, dizziness, or numbness occur
• Teach patient to take own B/P and pulse and record
• Advise patient to use sunscreen to prevent burns
• Teach patient to continue taking medication even if feeling better; this product controls symptoms but does not cure the condition
• Advise patient with hypertension to continue other medical regimen (exercise, weight loss, relaxation techniques, smoking cessation)
• Do not stop product abruptly

### Evaluation

**Positive therapeutic outcome**
• Decreased edema
• Decreased B/P

## TREATMENT OF OVERDOSE:

Lavage if taken orally, monitor electrolytes; administer dextrose in saline; monitor hydration, CV, renal status

**⚠ HIGH ALERT**

## metoprolol (Rx)

(met-oh-proe'lole)
**Lopressor, Nu-Metop ✱, Toprol-XL**
*Func. class.:* Antihypertensive, antianginal
*Chem. class.:* $\beta_1$-Adrenergic blocker

**Do not confuse:** Lopressor/Lyrica
Toprol-XL/Topamax

**ACTION:** Lowers B/P by β-blocking effects; reduces elevated renin plasma levels; blocks $\beta_2$-adrenergic receptors in bronchial, vascular smooth muscle only at high doses, negative chronotropic effect

**Therapeutic outcome:** Decreased B/P, heart rate, AV conduction

**USES:** Mild to moderate hypertension, acute MI to reduce cardiovascular mortality, angina pectoris, New York Heart Association class II, III heart failure, cardiomyopathy

## CONTRAINDICATIONS

Hypersensitivity to β-blockers, cardiogenic shock, heart block (2nd and 3rd degree), sinus bradycardia, pheochromocytoma, sick sinus syndrome

**Precautions:** Pregnancy, breastfeeding, geriatric, major surgery, diabetes mellitus, thyroid/renal/hepatic disease, COPD, CAD, nonallergic bronchospasm, HF, bronchial asthma, CVA, children, depression, vasospastic angina

**BLACK BOX WARNING:** Abrupt discontinuation

## DOSAGE AND ROUTES

### Hypertension

**Adult:** PO 50 mg bid, or 100 mg/day; may give 100-450 mg in divided doses; ext rel 25-100 mg qd, titrate at weekly intervals, max 400 mg/day
**Child/adolescent 6-16 yr:** PO ext rel 1 mg/kg up to 50 mg qd
**Geriatric:** PO 25 mg/day initially, increase weekly as needed

### Myocardial infarction

**Adult:** **IV** BOL (early treatment) 5 mg q2min × 3 doses, then 50 mg PO 15 min after last dose and q6hr × 48 hr (late treatment); PO maintenance 50-100 mg bid for 1-3 yr

### Heart failure (NYHA class II/III)
**Adult:** PO ext rel 25 mg qd × 2 wk (class II); 12.5 mg qd (class III)

### Angina
**Adult:** PO 100 mg/day as a single dose or in 2 divided doses, increase qwk as needed, or 100 mg ext rel tab daily, max 400 mg/day ext rel

### Migraine prevention (unlabeled)
**Adult:** PO 25-100 mg bid-qid; 50-200 mg daily (XL)

**Available forms:** Tabs 25, 50, 100 mg; inj 1 mg/ml; ext rel tabs (tartrate) 100 mg; ext rel tabs (succinate) (XL) 25, 50, 100, 200 mg

### Implementation
**PO route**
- Take apical pulse before giving, if <50 bpm hold and notify prescriber
- Do not break, crush, or chew ext rel tabs
- Give regular release tab before meals, at bedtime; tab may be crushed or swallowed whole; give with food to prevent GI upset; reduced dosage in renal dysfunction; give at same time each day
- Store in dry area at room temp; do not freeze

**Direct IV route**
- Check dose with another person to prevent errors that could be fatal
- Give 5 mg/2 min or more × 3 doses at 2 min intervals, start PO 15 min after last **IV** dose

**Y-site compatibilities:** Abciximab, acyclovir, alemtuzumab, alfentanil, alteplase, amikacin, aminophylline, amiodarone, amphotericin B liposome, anidulafungin, argatroban, ascorbic acid, atracurium, atropine, azaTHIOprine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, ceFAZolin, cefonicid, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, CISplatin, clindamycin, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doxacurium, DOXOrubicin, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, epoetin alfa, eptifibatide, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, folic acid, furosemide, ganciclovir, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, IDArubicin, ifosfamide, imipenem/cilastatin, indomethacin, insulin, isoproterenol, ketorolac, labetalol, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, meperidine, metaraminol, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metroNIDAZOLE, midazolam, milrinone, mitoXANtrone, morphine, multivitamins, nafcillin, nalbuphine, naloxone, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pancuronium, papaverine, PEMEtrexed, penicillin G, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, phytonadione, piperacillin/tazobactam, potassium chloride, procainamide, prochlorperazine, promethazine, propranolol, protamine, pyridoxine, quinupristin/dalfopristin, ranitidine, rocuronium, sodium bicarbonate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin/clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, voriconazole

**Y-site incompatibilities:** Allopurinol, amphotericin B cholesteryl/colloidal/lipid complex, dantrolene, diazepam, diazoxide, lepirudin, pantoprazole, phenytoin, trimethoprim/sulfamethoxazole

## ADVERSE EFFECTS
**CNS:** *Insomnia, dizziness,* mental changes, hallucinations, depression, anxiety, headaches, nightmares, confusion, fatigue
**CV:** HF, *palpitations,* dysrhythmias, cardiac arrest, AV block, *hypotension,* bradycardia, pulmonary/peripheral edema, chest pain
**EENT:** Sore throat, dry burning eyes
**GI:** *Nausea, vomiting,* colitis, cramps, *diarrhea,* constipation, flatulence, dry mouth, *hiccups*
**GU:** Impotence
**HEMA:** Agranulocytosis, eosinophilia, thrombocytopenic purpura
**INTEG:** Rash, purpura, alopecia, dry skin, urticaria, pruritus
**RESP:** Bronchospasm, dyspnea, wheezing

### Pharmacokinetics
| | |
|---|---|
| **Absorption** | Well absorbed (PO); completely absorbed (**IV**) |
| **Distribution** | Crosses blood-brain barrier, placenta |
| **Metabolism** | Liver, extensively by CYP2D6 |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 3-7 hr |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | 15 min | Immediate |
| **Peak** | 2-4 hr | 20 min |
| **Duration** | 6-19 hr | 5-8 hr |

## INTERACTIONS

### Individual drugs

Cimetidine: increased metoprolol level
EPINEPHrine, hydrALAZINE, methyldopa prazosin, reserpine: increased hypotension, bradycardia
Insulin: increased hypoglycemia

### Drug classifications

Antidiabetics (oral): increased hypoglycemia
Amphetamines, calcium channel blockers, histamine $H_2$ antagonists: increased hypotension, bradycardia
Barbiturates: decreased metoprolol level
MAOIs: do not use together
NSAIDs, salicylates: decreased antihypertensive effect
Xanthines: decreased effects of xanthines

### Drug/food

Increased: absorption with food

### Drug/lab test

Increased: BUN, potassium, ANA titer, serum lipoprotein, triglycerides, uric acid, alkaline phosphatase, LDH, AST, ALT

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Abrupt withdrawal:** may cause MI, ventricular dysrhythmias, myocardial ischemia; taper dose over 7-14 days

- **Hypertension/angina:** monitor ECG directly when giving IV during initial treatment
- Monitor B/P during beginning treatment, periodically thereafter; pulse q4hr; note rate, rhythm, quality; check apical/radial pulse before administration; notify prescriber of any significant changes (pulse <50 bpm)
- Check for baselines in renal, liver function tests before therapy begins and periodically thereafter
- Assess for edema in feet, legs daily; monitor I&O, daily weight; check for jugular vein distention, crackles bilaterally, dyspnea (HF)
- **Pregnancy/breastfeeding:** Use only if clearly needed, excreted in breast milk in small quantities, the American Academy of Pediatrics considers this product to be compatible with breastfeeding

### Patient/family education

**BLACK BOX WARNING:** Teach patient not to discontinue product abruptly; taper over 2 wk; may cause precipitate angina if stopped abruptly

- Teach patient not to use OTC products containing α-adrenergic stimulants (such as nasal decongestants, cold preparations); to avoid alcohol, smoking and to limit sodium intake as prescribed
- Teach patient how to take pulse and B/P at home; advise when to notify prescriber
- Instruct patient to comply with weight control, dietary adjustments, modified exercise program
- Tell patient to carry/wear emergency ID to identify product being taken, allergies; tell patient product controls symptoms but does not cure
- Caution patient to avoid hazardous activities if dizziness, drowsiness is present, to avoid driving until product response is known
- Teach patient to report symptoms of HF; difficult breathing, especially with exertion or when lying down, night cough, swelling of extremities or bradycardia, dizziness, confusion, depression, fever, decreased vision
- Teach patient to take product as prescribed, not to double doses or skip doses; take any missed doses as soon as remembered if at least 4 hr until next dose
- Advise to monitor blood glucose closely if diabetic
- Advise to report Raynaud's symptoms

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P in hypertension (after 1-2 wk)
- Absence of dysrhythmias
- Decreased anginal pain

## TREATMENT OF OVERDOSE:

Lavage, **IV** atropine for bradycardia, **IV** theophylline for bronchospasm, digoxin, $O_2$, diuretic for cardiac failure, hemodialysis, **IV** glucose for hyperglycemia, **IV** diazepam (or phenytoin) for seizures

## metroNIDAZOLE (Rx)

(me-troe-ni'da-zole)
**Flagyl, Flagyl ER, Flagyl IV, Flagyl IV RTU, Florazone ER, Novonidazole**
*Func. class.:* Antiinfective, miscellaneous
*Chem. class.:* Nitroimidazole derivative

**ACTION:** Direct-acting amebicide/trichomonacide; binds, degrades DNA structure, inhibiting bacterial nucleic acid synthesis

**Therapeutic outcome:** Trichomonacidal, amebicidal, bactericidal for the following susceptible organisms: *Bacteroides, Clostridium, Trichomonas vaginalis, Giardia lamblia, Entamoeba histolytica*

**USES:** Intestinal amebiasis, amebic abscess, trichomoniasis, refractory trichomoniasis, bacterial anaerobic infections, giardiasis; septicemia, endocarditis, bone, joint, and lower respiratory tract infections, rosacea

**Unlabeled uses:** Crohn's disease

## CONTRAINDICATIONS

Pregnancy (1st trimester), breastfeeding, hypersensitivity to this product

**Precautions:** Pregnancy (2nd/3rd trimesters), candidal infections, heart failure, fungal infection, geriatric, dental disease, bone marrow suppression, hematologic disease, renal/hepatic/GI disease, contracted visual or color fields, blood dyscrasias, CNS disorders

**BLACK BOX WARNING:** Secondary malignancy

## DOSAGE AND ROUTES

### Trichomoniasis

**Adult:** PO 500 mg bid × 7 days or 2 g in single dose; do not repeat treatment for 4-6 wk
**Child ≥45 kg (unlabeled):** PO 2 g once
**Child <45 kg (unlabeled):** PO 15 mg/kg/day divided in 3 doses × 7-10 days

### Amebic hepatic abscess

**Adult:** PO 750 mg tid × 7-10 days
**Child:** PO 35-50 mg/kg/day in 3 divided doses × 7-10 days

### Intestinal amebiasis

**Adult:** PO 750 mg tid × 7-10 days
**Child:** PO 35-50 mg/kg/day in 3 divided doses × 7-10 days; then oral iodoquinol

### Anaerobic bacterial infections

**Adult: IV** INF 15 mg/kg/over 1 hr, then 7.5 mg/kg **IV** or PO q6hr, max 4 g/day; first maintenance dose should be administered 6 hr after loading dose

### Bacterial vaginosis

**Adult:** PO reg rel 500 mg bid or 250 mg tid × 7 days; ext rel 750 mg/day × 7 days

### Giardiasis (unlabeled)

**Adult:** PO 250 mg tid × 5-7 days
**Child:** PO 5 mg/kg divided tid × 5 days

### Antibiotic-associated pseudomembranous colitis

**Adult (unlabeled):** PO 250-500 mg 3 times per day × 10-14 days
**Child:** PO 20 mg/kg/day (max 2 g) divided q6hr

**Available forms:** Tabs 250, 500 mg; ext rel tabs 750 mg; caps 375 mg; inj sol 5 mg/ml

### Implementation

- Store in light-resistant container; do not refrigerate

**PO route**

- Give with or after a meal to avoid GI symptoms, metallic taste; crush tab if needed, give on empty stomach

**Topical route**

- A thin coating should be applied to affected area after cleaning with soap and water and patting dry

**IV route**

- Give intermittent **IV** prediluted; for Flagyl **IV** dilute with 4.4 ml of sterile water or 0.9% NaCl; must be diluted further with ≤8 mg/ml 0.9% NaCl, $D_5W$, or LR; must neutralize with 5 mEq of $NaCO_3$/500 mg; $CO_2$ gas will be generated and may require venting; run over 1 hr or more; primary **IV** must be discontinued; may be given as cont inf; do not use aluminum products; **IV** may require venting

**Y-site compatibilities:** Acyclovir, alemtuzumab, alfentanil, allopurinol, amifostine, amikacin, aminophylline, amiodarone, ampicillin, ampicillin/sulbactam, anidulafungin, atracurium, bivalirudin, bumetanide, buprenorphine, busulfan, butorphanol, calcium acetate/chloride/gluconate, CARBOplatin, ceFAZolin, cefepime, cefoperazone, cefoTEtan, cefotaxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, codeine, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, dexamethasone, dexmedetomidine, dexrazoxane, digoxin, diltiazem, dimenhyDRINATE, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doripenem, doxacurium, doxapram, DOXOrubicin, DOXOrubicin liposome, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, foscarnet, fosphenytoin, furosemide, gemcitabine, gentamicin, glycopyrrolate, granisetron, haloperidol, heparin, hydrALAZINE, hydrocortisone, HYDROmorphone, IDArubicin, ifosfamide, imipenem/cilastatin, inamrinone, insulin, isoproterenol, ketorolac, labetalol, leucovorin, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, meropenem, mesna, metaraminol, methotrexate, methyldopate, methylPREDNISolone,

metoclopramide, metoprolol, midazolam, milrinone, mitoXANtrone, morphine, nafcillin, nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pancuronium, pentamidine, pentazocine, PENTobarbital, perphenazine, PHENobarbital, phentolamine, phenylephrine, piperacillin/tazobactam, potassium chloride/phosphates, prochlorperazine, promethazine, propranolol, ranitidine, remifentanil, riTUXimab, rocuronium, sargramostim, sodium acetate/bicarbonate/phosphates, streptozocin, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiopental, thiotepa, ticarcillin/clavulanate, tigecycline, tirofiban, tobramycin, trastuzumab, trimethobenzamide, trimethoprim/sulfamethoxazole, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

**Y-site incompatibilities:** Amphotericin B cholesteryl/colloidal/liposome, aztreonam, dantrolene, DAPTOmycin, diazepam, drotrecogin, filgrastim, ganciclovir, pantoprazole, PEMEtrexed, phenytoin, procainamide, quinupristin/dalfopristin

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness,* confusion, irritability, restlessness, ataxia, depression, fatigue, drowsiness, insomnia, paresthesia, peripheral neuropathy, seizures, incoordination, depression, encephalopathy, aseptic meningitis (IV)
**CV:** Flat T-waves
**EENT:** Blurred vision, sore throat, retinal edema, dry mouth, metallic taste, furry tongue, glossitis, stomatitis, photophobia, optic neuritis
**GI:** *Nausea, vomiting, diarrhea,* epigastric distress, *anorexia,* constipation, *abdominal cramps,* pseudomembranous colitis, xerostomia, metallic taste, abdominal pain, pancreatitis
**HEMA:** Leukopenia, bone marrow depression, aplasia, thrombocytopenia
**INTEG:** Rash, pruritus, urticaria, flushing, phlebitis at injection site, toxic epidermal necrolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 80% (PO) |
| **Distribution** | Widely distributed, crosses placenta |
| **Metabolism** | Liver |
| **Excretion** | Urine, unchanged; feces |
| **Half-life** | 6-11 hr |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | Rapid | Immediate |
| **Peak** | 1-2 hr | Infusion's end |
| **Duration** | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol, oral ritonavir, any product with alcohol: increased disulfiram-like reaction
AzaTHIOprine, fluorouracil: increased leukopenia
Amprenavir, disulfiram: do not use bortezomib; norfloxacin, zalcitabine: avoid use
Busulfan: increased busulfan toxicity, avoid concurrent use
Cholestyramine: decreased metroNIDAZOLE, toxicity
Fosphenytoin, lithium, phenytoin, warfarin: increased action of these drugs

### Drug classifications

Barbiturates: decreased metroNIDAZOLE half-life
CYP3A4 substrates: increased levels

### Drug/lab test

Altered: AST, ALT, LDH
Decrease: WBC, neutrophils
False decrease: triglycerides

## NURSING CONSIDERATIONS

### Assessment

- **Assess patient for signs and symptoms of infection** including characteristics of wounds, WBC >10,000/mm$^3$, vaginal secretions, fever; obtain baseline information and during treatment
- Obtain C&S before beginning product therapy to identify if correct treatment has been initiated
- **Assess for allergic reactions:** rash, urticaria, pruritus
- Identify urine output; if decreasing, notify prescriber **(may indicate nephrotoxicity)**; also check for increased BUN, creatinine
- Assess bowel pattern daily; if severe diarrhea occurs, product should be discontinued
- Assess for overgrowth of infection: perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum
- Teach patient to notify prescriber if pregnancy is planned or suspected

**BLACK BOX WARNING: Secondary malignancy:** use only when indicated, avoid unnecessary use

### Patient/family education

- Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
- Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate superinfection
- Advise patient to notify physician of numbness or tingling of extremities
- Teach trichomoniasis patient that both partners need to be treated; condoms should be used during intercourse to prevent reinfection
- **Pregnancy/breastfeeding:** Not to be used in breastfeeding or first trimester of pregnancy
- Advise patient of disulfiramlike reaction to alcohol ingestion; alcohol should not be used within 48 hr of this product
- Inform patient product has a metallic taste and urine may turn dark
- Advise patient to contact prescriber if pregnancy is suspected
- Advise patient to use sips of water, sugarless gum, candy for dry mouth

### Evaluation

**Positive therapeutic outcome**

- Decreased symptoms of infection

## metroNIDAZOLE topical
*See Appendix B*

## micafungin (Rx)

(my-ca-fun′gin)

**Mycamine**

*Func. class.:* Antifungal, systemic

*Chem. class.:* Echinocandin

**ACTION:** Inhibits an essential component in fungal cell walls; causes direct damage to fungal cell wall

**Therapeutic outcome:** Prevention of *Candida* infection in hematopoietic stem cell transplantation (HSCT); or decreased symptoms of *Candida* infection, negative culture

**USES:** Treatment of esophageal candidiasis; prophylaxis of *Candida* infections in patients undergoing HSCT; susceptible *Candida* species: *C. albicans, C. glabrata, C. krusei, C. parapsilosis, C. tropicalis,* prophylaxis of HIV-related esophageal candidiasis

## CONTRAINDICATIONS

Hypersensitivity to this product or other echinocandins

**Precautions:** Pregnancy, breastfeeding, children, geriatric, severe hepatic disease, renal impairment, hemolytic anemia

## DOSAGE AND ROUTES

### Candidemia/acute disseminated candidiasis, abscess, peritonitis

**Adult: IV** 100 mg/day over 1 hr

### Esophageal candidiasis

**Adult: IV** 150 mg/day, given over 1 hr

### Prophylaxis of *Candida* infections

**Adult: IV** 50 mg/day, given over 1 hr

**Available forms:** Powder for injection 50 mg, in single-dose vials; 50, 100 mg vial

### Implementation

- Protect diluted sol from light
- Do not use if cloudy or precipitated; do not admix product
- Flush line before, after administration with 0.9% NaCl

**IV route**

- **For *Candida* prevention:** reconstitute with provided diluent 0.9% NaCl without bacteriostatic product; 50 mg vial/5 ml (10 mg/ml), swirl to dissolve, do not shake; further dilute with 100 ml 0.9% NaCl, only; run over 1 hr
- **For *Candida* infection:** reconstitute with provided diluent 50 mg/5 ml (10 mg/ml); further dilute 3 reconstituted vials in 100 ml of 0.9% NaCl, run over 1 hr
- Store at room temperature, away from light; do not freeze; discard unused solution

**Y-site compatibilities:** Aminophylline, bumetanide, calcium chloride/gluconate, cycloSPORINE, DOPamine, eptifibatide, esmolol, fenoldopam, furosemide, heparin, HYDROmorphone, lidocaine, LORazepam, magnesium sulfate, milrinone, nitroglycerin, nitroprusside, norepinephrine, phenylephrine, potassium chloride, potassium phosphate, tacrolimus, vasopressin

**Y-site incompatibilities:** Albumin, amiodarone, cisatracurium, diltiazem, DOBUTamine, EPINEPHrine, insulin, labetalol, meperidine, midazolam, morphine, mycophenolate mofetil, nesiritide, niCARdipine, octreotide, ondansetron, phenytoin, telavancin, vecuronium

## ADVERSE EFFECTS

**CNS:** Convulsions, dizziness, *headache, somnolence,* fever, anxiety

**CV:** Flushing, hypertension, phlebitis, tachycardia, atrial fibrillation

**GI:** Abdominal pain, *nausea, anorexia, vomiting, diarrhea,* hepatitis

**GU:** Renal failure
**HEMA:** Neutropenia, thrombocytopenia, leukopenia, coagulopathy, anemia, hemolytic anemia
**INTEG:** *Rash, pruritus, inj site pain*
**META:** Hypokalemia, hypocalcemia, hypomagnesemia
**MS:** *Rigors*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| Distribution | Protein binding 99% |
| Metabolism | Liver |
| Excretion | Feces, urine |
| Half-life | Terminal 14-17.2 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Itraconazole, sirolimus, NIFEdipine: increased plasma concentrations; may need dosage reduction

### Drug/lab test

Increased: ALT/AST, alk phos, bilirubin
Decreased: blood glucose, potassium sodium

## NURSING CONSIDERATIONS

### Assessment

- Assess for signs and symptoms of infection, clearing of cultures during treatment; obtain culture baseline, throughout; product may be started as soon as culture is taken (esophageal candidiasis); monitor cultures during HSCT, for prevention of *Candida* infections
- Monitor CBC (RBC, Hct, Hgb), differential, platelet count periodically; notify prescriber of results
- Monitor renal studies: BUN, urine CCr, electrolytes before, during therapy
- Monitor hepatic studies before, during treatment: bilirubin, AST, ALT, alkaline phosphatase, as needed
- Assess for bleeding: hematuria, heme-positive stools, bruising or petechiae of mucosa or orifices; blood dyscrasias can occur
- Assess for hypersensitivity: rash, pruritus, facial swelling; also for phlebitis
- Assess for hemolytic anemia
- Assess **GI symptoms:** frequency of stools, cramping; if severe diarrhea occurs, electrolytes may need to be given
- **Pregnancy/breastfeeding:** Use cautiously in breastfeeding, in pregnancy use only if benefits outweigh fetal risk

### Patient/family education

- Advise patient to notify prescriber if pregnancy is suspected or planned
- Teach patient to avoid breastfeeding while taking this product
- Teach patient to inform prescriber of renal or hepatic disease
- Teach patient to report bleeding, facial swelling, wheezing, difficulty breathing, itching, rash, hives, increasing warmth, flushing
- Instruct patient to report signs of infection: increased temp, sore throat, flulike symptoms
- Advise patient to notify prescriber of nausea, vomiting, diarrhea, jaundice, anorexia, clay-colored stools, dark urine; hepatotoxicity may occur

### Evaluation

**Positive therapeutic outcome**

- Prevention of *Candida* infection in HSCT; decreased symptoms of *Candida* infection, negative culture

## miconazole (Rx, OTC)

(mi-kon'a-zole)
**Oravig**
## miconazole nitrate
**Femizole-M 🍁, Monistat, Monistat 3, Monistat 7, Monistat-Derm, Monistat Dual-Pak, Dual Pack; topical: Micatin, Micatin Liquid, Vagistat 3**
*Func. class.:* Antifungal
*Chem. class.:* Imidazole

**ACTION:** Alters cell membranes, inhibits fungal enzymes, inhibits sterols so intracellular contents are lost, prevents biosynthesis of phospholipids/triglycerides

**Therapeutic outcome:** Fungistatic/fungicidal against *Aspergillus, Coccidioides, Cryptococcus, Candida, Dermatophytes, Histoplasma*

**USES:** Coccidioidomycosis, candidiasis, cryptococcosis, paracoccidioidomycosis, chronic mucocutaneous candidiasis, fungal meningitis; **IV** used for severe infections only; topical for tinea pedis, tinea cruris, tinea corporis, tinea versicolor, vaginal or vulva candidal infections

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, renal/hepatic disease

## DOSAGE AND ROUTES

### Oropharyngeal candidiasis (thrush)

**Adult/adolescent ≥16 yr:** Buccal apply 1 tab (50 mg) to upper gum region just above incisor tooth q day × 14 days

**Adult: IV** INF 200-3600 mg/day; may be divided in 3 INF at 200-1200 mg/INF; may have to repeat course; IT 20 mg given simultaneously with **IV** for fungal meningitis q1-2day
**Child: IV** 20-40 mg/kg/day, max 15 mg/kg/day
**Adult and child:** TOP apply to affected area bid × 2-4 wk
**Adult:** Intravaginal 200 mg SUPP at bedtime × 3 days or 100 mg SUPP × 1 wk

**Available forms:** Inj 10 mg/ml; aerosol 2%; cream 2%; lotion 2%; powder 2%; spray 2%; vag cream 2%; vag supp 100, 200 mg; buccal tab 50 mg

### Implementation

• Have adrenalin, suction, tracheostomy set, endotracheal intubation equipment available

**Transmucosal use (adhesive buccal tablet)**

• Apply tab in the morning after brushing the teeth; use dry hands
• Place the rounded surface of the tab against the upper gum just above the incisor tooth; hold in place with a slight pressure over the upper lip for 30 seconds to ensure adhesion
• Although the tab is rounded on one side for comfort, the flat side may also be applied to the gum
• The tab will gradually dissolve
• Administration of subsequent tabs should be made to alternating sides of the mouth
• Before applying the next tab, clear away any remaining tab material
• Do not crush, chew or swallow; food and drink can be taken normally; avoid chewing gum
• If tab does not adhere or falls off within the first 6 hr, the same tab should be repositioned immediately. If the tab still does not adhere, a new tab should be used
• If the tab falls off or is swallowed after it was in place for 6 hr or more, a new tab should not be applied until the next regularly scheduled dose

**Topical route**

• Apply after cleansing area with soap and water before each application; use enough medication to cover lesions completely; dry well
• Store at room temperature in dry place

**Vaginal route**

• Administer 1 applicator full every night high into the vagina
• Store at room temperature in dry place

**IV route**

• Give 200 mg initially to prevent severe hypersensitive reaction
• Give **IV** after diluting in ≤1 g/10 ml of sterile water, $D_5W$, or 0.45% NaCl over 3-5 min
• Give by intermittent **IV** after diluting in 200 ml or more $D_5W$ or 0.9% NaCl; give over 30-60 min
• Store at room temperature; reconstituted sol is stable for 24 hr refrigerated

**Y-site compatibilities:** Allopurinol, filgrastim, foscarnet, granisetron, melphalan, ondansetron, propofol, sargramostim, teniposide, thiotepa, vinorelbine

**Y-site incompatibilities:** Fludarabine

## ADVERSE EFFECTS

**CNS:** Drowsiness, headache, lethargy
**CV:** Tachycardia, dysrhythmias (rapid **IV**)
**GI:** Nausea, vomiting, anorexia, diarrhea, cramps
**GU:** Vulvovaginal burning, itching, hyponatremia, pelvic cramps (topical forms)
**HEMA:** Decreased Hct, thrombocytopenia, hyperlipidemia
**INTEG:** Pruritus, rash, fever, flushing, hives
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Poorly absorbed (PO) |
| **Distribution** | Widely distributed (**IV**); bound to serum proteins (90%) |
| **Metabolism** | Liver, extensively |
| **Excretion** | Unknown |
| **Half-life** | Triphasic: 0.4, 2.1, 24 hr |

### Pharmacodynamics

| | IV | Topical | Vag |
|---|---|---|---|
| **Onset** | Rapid | Unknown | Unknown |
| **Peak** | Infusion's end | Unknown | Unknown |
| **Duration** | Unknown | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Amphotericin B: decreased effect of amphotericin B
Amphotericin B, isoniazid, rifampin: decreased effect of miconazole
Phenytoin: increased effect
Warfarin: increased anticoagulant effect

### Drug classifications

Sulfonylureas: increased effect

### Drug/lab test

False positive: urine glucose, urine protein

## NURSING CONSIDERATIONS

### Assessment

• Assess for signs and symptoms of infection: drainage, sore throat, urinary pain, hematuria, fever

• Obtain C&S before beginning treatment; therapy may be started after culture is taken; monitor signs of infection before, throughout treatment
• Monitor bowel pattern before, during treatment; diarrhea may occur
• Monitor cardiac system: B/P, pulse; watch for increasing pulse, cardiac dysrhythmias; product should be discontinued
• Monitor blood studies: WBC, RBC, Hgb, Hct, bleeding time; patients taking anticoagulants may need a decreased dosage; monitor liver and renal studies periodically for patients on long-term therapy
• Monitor I&O ratio; watch for decreasing urinary output, change in specific gravity; discontinue product to prevent renal damage; patients with renal disease may require lowered dose
• Monitor **IV** site for thrombophlebitis; site should be changed q48-72hr
• Monitor for allergies before initiation of treatment and reaction to each medication; highlight allergies on chart; check for allergic reaction: burning, stinging, swelling, redness (topical); observe for skin eruptions after administration of product to 1 wk after discontinuing product
• **Pregnancy/breastfeeding:** Use cautiously in breastfeeding, use PO form in pregnancy only if benefits outweigh fetal risk

### Patient/family education

• Inform patient that culture may be performed after completed course of medication
• Advise patient to notify nurse of diarrhea, symptoms of candidal vaginitis

**Topical route**

• Teach patient to use medical asepsis (hand washing) before, after each application; to apply with glove to prevent further infection; to avoid contact with eyes; not to use occlusive dressings
• Caution patient to avoid use of OTC creams, ointments, lotions unless directed by prescriber
• Instruct patient to notify prescriber if condition does not improve in 4 wk or if symptoms return in 2 mo; pregnancy or a serious medical condition may be the cause
• Teach patient to use for full prescribed treatment time, or reinfection may occur

**Vaginal route**

• Instruct patient in asepsis (hand washing) before, after each application
• Teach patient to apply with applicator only; to avoid use of any other vaginal product unless directed by prescriber; sanitary napkin may prevent soiling of undergarments; to abstain from sexual intercourse until treatment is completed or reinfection and irritation may occur; not to use tampons, douches, spermicides; not to engage in sexual activity; product may damage condoms, diaphragms, cervical caps
• Instruct patient to notify prescriber if symptoms persist

### Evaluation

**Positive therapeutic outcome**

• Decreasing oral candidiasis, fever, malaise, rash
• Negative C&S for infectious organism
• Decrease in size, number of lesions
• Decrease in itching or white discharge (vaginal)

### TREATMENT OF OVERDOSE:

Withdraw product; maintain airway; administer EPINEPHrine, aminophylline, $O_2$, **IV** corticosteroids for anaphylaxis

## miconazole topical

*See Appendix B*

## miconazole vaginal antifungal

*See Appendix B*

M

**⚠ HIGH ALERT**

## midazolam (Rx)

(mid'ay-zoe-lam)
*Func. class.:* Sedative/hypnotic, antianxiety
*Chem. class.:* Benzodiazepine, short-acting
**Controlled substance schedule IV**

**ACTION:** Depresses subcortical levels in CNS; may act on limbic system, reticular formation; may potentiate GABA by binding to specific benzodiazepine receptors

**Therapeutic outcome:** Sedation for anesthesia induction and procedures

**USES:** Preoperative sedation, general anesthesia induction, sedation for diagnostic endoscopic procedures, intubation, anxiety

**Unlabeled uses:** Refractory status epilepticus, alcohol withdrawal, agitation

**CONTRAINDICATIONS**

Pregnancy, hypersensitivity to benzodiazepines, acute closed-angle glaucoma, epidural/intrathecal use

**Precautions:** Breastfeeding, children, geriatric, COPD, HF, chronic renal failure, chills, debilitated, hepatic disease, shock, coma, alcohol intoxication, status asthmaticus

**BLACK BOX WARNING:** Neonates (contains benzyl alcohol), **IV** administration, respiratory depression/insufficiency, specialized care setting, experienced clinician, coadministration with other CNS depressants

## DOSAGE AND ROUTES

### Preoperative sedation/amnesia induction

**Adult and child ≥12 yr:** IM 0.07-0.08 mg/kg 30-60 min before general anesthesia
**Child 6 mo-5 yr:** **IV** 0.05-0.1 mg/kg, a total dose of 0.6 mg/kg may be needed
**Child 6-12 yr:** **IV** 0.025-0.05 mg/kg, a total dose of 0.4 mg/kg may be needed

### Induction of general anesthesia

**Adult >55 yr:** (ASA I/II) **IV** 150-300 mcg/kg over 30 sec; (ASA III/IV) limit dose to 250 mcg/kg (nonpremedicated) or 150 mcg/kg (premedicated)
**Adult <55 yr:** **IV** 200-350 mcg/kg over 20-30 sec; if patient has not received premedication, may repeat by giving 20% of original dose; if patient has received premedication reduce dosage by 50 mcg/kg
**Child:** No safe and effective dosage is established; however, doses of 50-200 mcg/kg **IV** have been used

### Continuous infusion for mechanical ventilation (critical care)

**Adult:** **IV** 0.01-0.05 mg/kg over several min; repeat at 10-15 min intervals until adequate sedation, then 0.02-0.10 mg/kg/hr maintenance; adjust as needed
**Child:** **IV** 0.05-0.2 mg/kg over 2-3 min, then 0.06-0.12 mg/kg/hr by CONT INF; adjust as needed
**Neonate:** **IV** 0.03 mg/kg/hr titrate using lowest dose

### Alcohol withdrawal (unlabeled)

**Adult:** **IV** 1-5 mg q1-2hr (mild-moderate symptoms); cont IV inf 1-20 mg q1-2hr (delirium tremens)

**Available forms:** Inj 1, 5 mg/ml, 25 mg/5 ml, 50 mg/10 ml; syr 2 mg/ml

### Implementation

- Store at room temperature; protect from light

**PO route**

- Remove cap of press-in bottle adaptor and push adaptor into neck of bottle; close with cap, remove cap, and insert tip of dispenser and insert into adaptor; turn upside-down and withdraw correct dose; place in mouth

**IM route**

- Give inj deep into large muscle mass

**IV route**

- Give **IV** undiluted or after diluting with $D_5W$ or 0.9% NaCl to a conc of 0.25 mg/ml; give over 2 min (conscious sedation) or over 30 sec (anesthesia induction)
- Ensure immediate availability of resuscitation equipment, $O_2$ to support airway; do not give by rapid bol

**Y-site compatibilities:** Abciximab, acetaminophen, alemtuzumab, alfentanil, amikacin, amiodarone, anidulafungin, argatroban, atracurium, atropine, aztreonam, benztropine, calcium gluconate, ceFAZolin, cefotaxime, cefOXitine, cefTRIAXone, cimetidine, ciprofloxacin, CISplatin, clindamycin, cloNIDine, cyanocobalamin, cycloSPORINE, DACTINomycin, digoxin, diltiazem, diphenhydrAMINE, DOCEtaxal, DOPamine, doxycycline, enalaprilat, EPINEPHrine, erythromycin, esmolol, etomidate, etoposide, famotidine, fentaNYL, fluconazole, folic acid, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hetastarch, HYDROmorphone, hydrOXYzine, inamrinone, isoproterenol, labetalol, lactated Ringer's, levofloxacin, lidocaine, linezolid, LORazepam, magnesium, mannitol, meperidine, methadone, methyldopa, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, milrinone, morphine, nalbuphine, naloxone, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, ondansetron, oxacillin, oxytocin, PACLitaxel, palonosetron, pancuronium, papaverine, phentolamine, phytonadione, piperacillin, potassium chloride, propanolol, protamine, pyridoxine, ranitidine, remifentanil, sodium nitroprusside, streptokinase, succinylcholine, SUFentanil, teniposide, theophylline, thiotepa, ticarcillin, tobramycin, vancomycin, vasopressin, vecuronium, verapamil, voriconazole, zoledronic acid

**Y-site incompatibilities:** Foscarnet

## ADVERSE EFFECTS

**CNS:** Retrograde amnesia, euphoria, confusion, headache, anxiety, insomnia, slurred speech, paresthesia, tremors, weakness, chills, agitation, paradoxical reactions
**CV:** Hypotension, PVCs, tachycardia, bigeminy, nodal rhythm, cardiac arrest
**EENT:** Blurred vision, nystagmus, diplopia, loss of balance
**GI:** *Nausea, vomiting,* increased salivation, hiccups
**INTEG:** Urticaria, pain at injection site, swelling at inj site, rash, pruritus at injection site

**RESP:** Coughing, apnea, bronchospasm, laryngospasm, dyspnea, respiratory depression

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Crosses placenta, blood-brain barrier; protein binding 97% |
| **Metabolism** | Liver; by CYP3A4 to metabolites excreted in urine |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 1-5 hr |

### Pharmacodynamics

| | PO | IM | IV |
|---|---|---|---|
| **Onset** | 10-30 min | 15 min | 1.5-5 min |
| **Peak** | Unknown | ½-1 hr | Unknown |
| **Duration** | Unknown | 2-3 hr | <2 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased respiratory depression
Cimetidine, erythromycin, ranitidine, theophylline: decreased midazolam metabolism
FluvoxaMINE, indinavir, ritonavir, verapamil, protease inhibitors: increased respiratory depression

### Drug classifications

Antihypertensives, nitrates, opiates: increase in hypotension
Barbiturates, opiate analgesics, other CNS depressants: increased respiratory depression
CYP3A4 inducers (azole antifungals, theophylline): increased half-life of midazolam
CYP3A4 inhibitors: increased levels of midazolam

### Drug/herb

Kava, valerian: increased sedation
St. John's wort: decreased midazolam

### Drug/food

Grapefruit juice: increased midazolam effect (PO)

## NURSING CONSIDERATIONS

### Assessment

- Monitor B/P, pulse, respiration during **IV;** $O_2$ and emergency equipment should be nearby
- Monitor inj site for redness, pain, swelling
- Assess degree of amnesia in geriatric; may be increased
- Assess anterograde amnesia
- Assess vital signs for recovery period in obese patient, since half-life may be extended
- **Respiratory depression/insufficiency:** assess for apnea, respiratory depression, which may be increased in the geriatric
- **Beers:** Avoid in older adults with or at high risk for delirium, assess frequently for confusion, delirium
- **Pregnancy/breastfeeding:** Do not use in pregnancy, avoid use in breastfeeding, excreted in breast milk

### Patient/family education

- Inform patient that amnesia occurs; events might not be remembered
- Caution patient to avoid CNS depressants including alcohol for 24 hr after taking this product

### Evaluation

**Positive therapeutic outcome**
- Induction of sedation, amnesia

**TREATMENT OF OVERDOSE:** $O_2$, flumazenil

**⚠ HIGH ALERT**

## milrinone (Rx)

(mill-re'none)
*Func. class.:* Inotropic/vasodilator agent with phosphodiesterase activity
*Chem. class.:* Bipyridine derivative

**ACTION:** Positive inotropic agent with vasodilator properties; increases contractility of cardiac muscle; reduces preload and afterload by direct relaxation of vascular smooth muscle; increases myocardial contractility

**Therapeutic outcome:** Increased inotropic effect resulting in increased cardiac output

**USES:** Short-term management of advanced HF that has not responded to other medication

## CONTRAINDICATIONS

Hypersensitivity to this product, severe aortic disease, severe pulmonic valvular disease, acute MI

**Precautions:** Pregnancy, breastfeeding, children, geriatric, renal/hepatic disease, atrial flutter/fibrillation

## DOSAGE AND ROUTES

**Adult: IV** BOL 50 mcg/kg given over 10 min; start INF of 0.375-0.75 mcg/kg/min; reduce dosage in renal impairment

### Renal dose

**Adult:** IV CCr 41-50 ml/min 0.43 mcg/kg/min, titrate up; CCr 31-40 ml/min 0.38 mcg/kg/min, titrate up; CCr 21-30 ml/min 0.33 mcg/kg/min, titrate up; CCr 11-20 ml/min 0.28 mcg/kg/min; CCr 6-10 ml/min 0.23 mcg/kg/min; CCr <6 ml/min 0.20 mcg/kg/min; max all dosages 0.75 mcg/kg/min

**Available forms:** Inj 1 mg/ml; premixed inj 200 mcg/ml in $D_5W$

### Implementation

**Direct IV route**
- Give **IV** loading dose undiluted over 10 min; use controlled-rate device
- Administer by direct **IV** into inf through Y-connector or directly into tubing

**Continuous IV infusion route**
- Dilute 20 mg vial with 80, 112, 180 ml of 0.45% NaCl, 0.9% NaCl, or $D_5W$ to a concentration of 200, 150, 100 mcg/ml respectively
- Do not mix directly with glucose sol (chemical reaction occurs over 24 hr) precipitate forms if milrinone and furosemide come into contact
- Titrate rate based on hemodynamic and clinical response, use controlled device
- Administer potassium supplements if ordered for potassium levels <3.0 mg/dl

**Y-site compatibilities:** Acyclovir, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amiodarone, amphotericin B liposome, ampicillin, ampicillin-sulbactam, anidulafungin, argatroban, atenolol, atracurium, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, busulfan, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, cefAZolin, cefepime, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, digoxin, diltiazem, DOBUTamine, DOCEtaxel, DOPamine, doripenem, doxacurium, DOXOrubicin, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, eptifibatide, ertapenem, erythromycin, etoposide, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, gallium, ganciclovir, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, haloperidol, heparin, hydrALAZINE, hydrocortisone, HYDROmorphone, IDArubicin, ifosfamide, insulin (regular), irinotecan, isoproterenol, ketorolac, labetalol, levofloxacin, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, meropenem, methohexital, methotrexate, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, micafungin, midazolam, mitoXANtrone, morphine, mycophenolate, nafcillin, nalbuphine, naloxone, nesiritide, norepinephrine, octreotide, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, PEMEtrexed, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phenylephrine, piperacillin, piperacillin-tazobactam, polymyxin B, potassium chloride/phosphates, prochlorperazine, promethazine, propofol, propranolol, quiNIDine, quinupristin-dalfopristin, ranitidine, remifentanil, rocuronium, sodium acetate/bicarbonate/phosphates, streptozocin, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, tacrolimus, teniposide, theophylline, thiopental, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, torsemide, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CV:** Dysrhythmias, hypotension, chest pain, PVCs
**GI:** Nausea, vomiting, anorexia, abdominal pain, hepatotoxicity, jaundice
**HEMA:** Thrombocytopenia
**MISC:** Headache, hypokalemia, tremor, injection site reactions

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Completely absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Liver (50%) |
| **Excretion** | Kidney, unchanged (83%), metabolites (12%) |
| **Half-life** | 2.4 hr; increased in HF |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 2-5 min |
| **Peak** | 10 min |
| **Duration** | Variable |

## INTERACTIONS

### Drug classifications

Antihypertensives, diuretics: increased effects

## NURSING CONSIDERATIONS

### Assessment

- Monitor for hypokalemia: acidic urine, reduced urine, osmolality, nocturia; hypotension, broad T-wave, U-wave, ectopy, tachycardia, weak pulse; muscle weakness, altered LOC, drowsiness, apathy, lethargy, confusion, depression; anorexia, nausea, cramps, constipation, distention, paralytic ileus; hypoventilation, respiratory muscle weakness
- Assess fluid volume status: complete I&O ratio and record; note weight, distended red veins, crackles in lung; color, quality, and specific gravity of urine; skin turgor, adequacy of pulses, moist mucous membranes, bilateral lung sounds, peripheral pitting edema; dehydration symptoms of decreasing output, thirst, hypotension, dry mouth and mucous membranes should be reported

• Monitor electrolytes: potassium, sodium, calcium, magnesium; also include BUN, blood pH, ABGs
• Monitor B/P and pulse, ECG continuously during IV; ventricular dysrhythmia can occur; PCWP, CVP, index often during inf; if B/P drops 30 mm Hg, stop inf and call prescriber
• Monitor ALT, AST, bilirubin daily; if these are elevated, hepatotoxicity is suspected
• Monitor platelets; if <150,000/mm$^3$, product is usually discontinued and another product started
• Assess for extravasation: change site q48hr
• **Pregnancy/breastfeeding:** Only use in pregnancy if benefits outweigh fetal risk, cautious use in breastfeeding, excretion unknown

### Patient/family education
• Teach patient reason for medication and expected results
• Instruct patient to make position changes slowly; orthostatic hypotension may occur
• Teach patient signs and symptoms of hypersensitivity reactions and hypokalemia

### Evaluation
**Positive therapeutic outcome**
• Increased cardiac output
• Decreased PCWP, adequate CVP
• Decreased dyspnea, fatigue, edema, ECG

## TREATMENT OF OVERDOSE:
Discontinue product, support circulation

## RARELY USED

## miltefosine
(mil′-te-foe′-seen)
**Impavido**
*Func. class.:* antiprotozoal/antileishmanial

## USES:
Treatment of visceral leishmaniasis caused by *L. donovani;* mucosal leishmaniasis caused by *L. braziliensis;* and cutaneous leishmaniasis caused by *L. braziliensis, L. guyanensis,* and *L. panamensis*

## CONTRAINDICATIONS
Hypersensitivity, pregnancy

## DOSAGE AND ROUTES
**Adult/adolescent/child ≥ 12 yr and ≥45 kg:**
**PO** 50 mg tid × 28 days
**Adult/adolescent/child ≥ 12 yr and 30 to 44 kg:**
**PO** 50 mg bid × 28 days; HIV guidelines suggest 100 mg qday × 4 wk in adults and adolescents regardless of weight

## minocycline (Rx)
(min-oh-sye′kleen)
**Arestin, Minocin, Solodyn**
*Func. class.:* Broad-spectrum antiinfective
*Chem. class.:* Tetracycline

## ACTION:
Inhibits protein synthesis and phosphorylation in microorganisms by binding to 30S ribosomal subunits and reversibly binding to 50S ribosomal subunits; bacteriostatic

**Therapeutic outcome:** Bactericidal action against susceptible organisms, including *Neisseria meningitidis, Neisseria gonorrhoeae, Treponema pallidum, Chlamydia trachomatis, Ureaplasma urealyticum, Mycoplasma pneumoniae, Nocardia, Rickettsia*

## USES:
Syphilis, chlamydial infection, gonorrhea, lymphogranuloma venereum, rickettsial infections, inflammatory acne, meningitis carriers, periodontitis, methicillin-resistant *Staphylococcus aureus* (MRSA) infections, nonnodular moderate to severe acne vulgaris, *Rickettsia* sp.

## CONTRAINDICATIONS
Pregnancy, hypersensitivity to tetracyclines, children <8 yr

**Precautions:** Breastfeeding, hepatic disease

## DOSAGE AND ROUTES
**Adult:** PO/**IV** 200 mg, then 100 mg q12hr, max 400 mg/24 hr **IV;** subgingival insert into periodontal pocket
**Child >8 yr:** PO/**IV** 4 mg/kg then 4 mg/kg/day PO in divided doses q12hr

### Rickettsial infections
**Adult:** PO/**IV** 200 mg, then 100 mg q12hr
**Adolescent/child ≥8 yr:** PO/**IV** 4 mg/kg, then 2 mg kg q12hr, max adult dose

### Gonorrhea
**Adult:** PO 200 mg, then 100 mg q12hr × 4 days or more

### Syphilis
**Adult:** PO 200 mg, then 100 mg q12hr × 10-15 days

### Uncomplicated gonococcal urethritis in men
**Adult:** PO 100 mg q12hr × 5 days

### Rheumatoid arthritis (unlabeled)
**Adult:** PO 100 mg bid for ≤48 wk

### Acne vulgaris (solodyn only)
**Adult/adolescent/child ≥12 yr:** ext rel 1 mg/kg/day × 12 wk or those weighing 126-136 kg: 135 mg/day; 111-125 kg: 115 mg/day; 97-110 kg:

105 mg/day; 85-96 kg: 90 mg/day; 72-84 kg: 80 mg/day; 60-71 kg: 65 mg/day; 50-59 kg: 55 mg/day; 45-49 kg: 45 mg/day

### Acne vulgaris (all except solodyn)

**Adult/adolescent/child ≥12 yr:** ext rel 1 mg/kg × 12 wk or 91-136 kg/135 mg/day; 60-90 kg 90 mg/day; 45-59 kg 45 mg/day

**Available forms:** Caps 50, 75, 100 mg; powder for inj 100 mg; pellet-filled caps 50, 100 mg; tabs 50, 75, 100 mg; ext rel tabs 45, 55, 65, 80, 90, 105, 115, 135 mg

### Implementation

- Store in airtight, light-resistant container at room temp

**PO route**

- Give around the clock to maintain proper blood levels; give with food to increase absorption of product; do not give within 3 hr of other agents; product interactions may occur
- Give with 8 oz of water 1 hr before bedtime to prevent ulceration
- Shake liquid preparation well before giving; use calibrated device for proper dosing
- Do not give with iron, calcium, magnesium products, or antacids, which decrease absorption and form insoluble chelate

**IV route**

- Check for irritation, extravasation, phlebitis daily; change site q72hr
- For intermittent inf, dilute each 100 mg/10 ml of 0.9% NaCl, sterile water for inj; further dilute in 500-1000 ml of 0.9% NaCl, $D_5W$, Ringer's, LR, $D_5$/LR; give over 6 hr

**Y-site compatibilities:** Alfentanil, amikacin, atracurium, benztropine, bretylium, buprenorphine, butorphanol, calcium chloride, CARBOplatin, caspofungin, cefonicid, chlorproMAZINE, cimetidine, codeine, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, dexmedetomidine, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, doxacurium, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, eptifibatide, etoposide, fenoldopam, fentaNYL, fludarabine, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hetastarch, IDArubicin, ifosfamide, inamrinone, isoproterenol, labetalol, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, melphalan, metaraminol, methotrexate, methyldopa, metoclopramide, metoprolol, midazolam, mitoXANtrone, nalbuphine, naloxone, perphenazine, potassium chloride, sargramostim, sodium succinate, vinorelbine, vit B/C

**Y-site incompatibilities:** Aztreonam, filgrastim, HYDROmorphone, meperidine, morphine, teniposide

## ADVERSE EFFECTS

**CNS:** *Dizziness,* fever, light-headedness, vertigo, seizures, increased intracranial pressure
**CV:** Pericarditis
**EENT:** Dysphagia, glossitis, decreased calcification, permanent discoloration of teeth, oral candidiasis
**GI:** *Nausea,* abdominal pain, *vomiting, diarrhea,* anorexia, enterocolitis, hepatotoxicity, flatulence, abdominal cramps, epigastric burning, stomatitis, pseudomembranous colitis
**GU:** Increased BUN, polyuria, polydipsia, renal failure, nephrotoxicity
**HEMA:** Eosinophilia, neutropenia, thrombocytopenia, hemolytic anemia, pancytopenia
**INTEG:** *Rash, urticaria, photosensitivity, increased pigmentation,* exfoliative dermatitis, pruritus, blue-gray color of skin and mucous membranes
**MS:** Myalgia, arthritis, bone discoloration, joint stiffness
**SYST:** Angioedema, Stevens-Johnson syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO) |
| **Distribution** | Widely distributed; some distribution in CSF, crosses placenta |
| **Metabolism** | Liver, some |
| **Excretion** | Kidneys, unchanged (20%), bile, feces |
| **Half-life** | 11-17 hr |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | Rapid | Rapid |
| **Peak** | 2-3 hr | Infusion's end |
| **Duration** | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Calcium: forms chelates, decreased absorption
CarBAMazepine, phenytoin: decreased effect
Digoxin: increased effect
Insulin: increased effect
Kaolin/pectin, sodium bicarbonate, cimetidine, quinapril, sucralfate, iron: decreased minocycline effect
Theophylline: increased effect
Warfarin: increased effect

### Drug classifications

Alkali products, antacids: decreased minocycline effect
Anticoagulants (oral neuromuscular blockers): increased effect
Barbiturates, penicillins: decreased effect
Retinoids: increased chance of pseudomotor cerebri, do not use concurrently

### Drug/lab test

False negative: urine glucose with Clinistix, Tes-Tape

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for previous sensitivity reaction
- **Assess patient for signs and symptoms of infection** including characteristics of wounds, sputum, urine, stool, WBC >10,000/mm$^3$, fever; obtain baseline information before, during treatment
- Obtain C&S before beginning product therapy to identify if correct treatment has been initiated
- **Assess for allergic reactions:** rash, urticaria, pruritus, angioedema
- Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, alkaline phosphatase, amylase monthly if patient is on long-term therapy
- **Pseudomembranous colitis:** assess bowel pattern daily; if severe diarrhea occurs, product should be discontinued
- Monitor for bleeding: ecchymosis, bleeding gums, hematuria, stool guaiac daily if on long-term therapy; blood dyscrasias may occur
- **Assess for overgrowth of infection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum; black, furry tongue

**BLACK BOX WARNING: Cardiac disease:** May cause reflex increase in heart rate and decrease B/P

- **Beers:** Avoid use in older adults, may exacerbate syncope, monitor frequently for syncope
- **Pregnancy/breastfeeding:** Do not use in pregnancy, can cause fetal harm, if pregnancy occurs, stop immediately, do not breastfeed, excreted in breast milk

### Patient/family education

- Teach patient to use sunscreen when outdoors to decrease photosensitivity reaction
- Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
- Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate superinfection; report itching, rash, pruritus, urticaria
- Instruct patient to take all medication prescribed for the length of time ordered; product must be taken around the clock to maintain blood levels; do not give medication to others; take with a full glass of water; may take with food; not to use outdated product, Fanconi's syndrome may occur

### Evaluation

**Positive therapeutic outcome**

- Absence of signs/symptoms of infection (WBC <10,000/mm$^3$, temp WNL, absence of red, draining wounds)
- Reported improvement in symptoms of infection

## minoxidil (Rx, OTC)

(mi-nox'i-dill)
**Rogaine (TOP)**
*Func. class.:* Antihypertensive, hair growth stimulant
*Chem. class.:* Vasodilator, peripheral

**ACTION:** Directly relaxes arteriolar smooth muscle, causing vasodilation; reduces peripheral vascular resistance, decreases B/P; increased cutaneous blood flow; stimulation of hair follicles

**Therapeutic outcome:** Decreased B/P in hypertension; hair growth

**USES:** Severe hypertension unresponsive to other therapy (use with diuretic and β-blocker); topically to treat alopecia, anal fissures

## CONTRAINDICATIONS

Dissecting aortic aneurysm, hypersensitivity, pheochromocytoma

**Precautions:** Pregnancy, breastfeeding, children, geriatric, renal disease, CVD, acute MI

**BLACK BOX WARNING:** CAD, HF, cardiac disease, cardiac tamponade, edema, hypotension, orthostatic hypotension, pericardial effusion

## DOSAGE AND ROUTES

### Severe hypertension

**Adult:** PO 5 mg/day in 1-2 divided doses, max 100 mg/day; usual range 10-40 mg/day divided in 1-2 doses
**Geriatric:** PO 2.5 mg/day, may be increased gradually
**Child <12 yr:** PO initial 0.1-0.2 mg/kg/day; effective range, 0.25-1 mg/kg/day; max, 50 mg/day

### Alopecia
**Adult:** TOP 1 ml bid, rub into scalp daily, max 2 ml/day

### Renal dose
**Adult:** PO CCr 10-15 ml/min extend interval to q24hr; CCr <10 ml/min not recommended

### Anal fissures (unlabeled)
**Adult/adolescent:** TOP (0.5% minoxidil in white paraffin base) 0.5 g each compounded minoxidil and lignocaine ointment q8hr

**Available forms:** Tabs 2.5, 10 mg; topical 2%, 5% sol, topical foam 5%

### Implementation
**PO route**
- Administer without regard to meals
- Give with β-blockers and/or diuretic for hypertension
- Store protected from light and heat

**Topical route**
- Administer 1 ml dose no matter how much balding has occurred; increasing dose does not speed hair growth
- Treatment must continue long term or new hair will be lost again

## ADVERSE EFFECTS
### Systemic
**CNS:** Headache, fatigue
**CV:** *Severe rebound hypertension (on withdrawal in children),* tachycardia, angina, increased T-wave, HF, pulmonary edema, pericardial effusion, edema, sodium retention, water retention, *hypotension*
**GI:** Nausea, vomiting
**GU:** Breast tenderness
**HEMA:** Hct, Hgb, erythrocyte count may decrease initially, leukopenia
**INTEG:** Pruritus, Stevens-Johnson syndrome, rash, hirsutism, contact dermatitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO); minimally absorbed (topical) |
| **Distribution** | Widely distributed, protein binding minimal |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 4.2 hr |

### Pharmacodynamics

| | PO | Topical |
|---|---|---|
| **Onset** | ½ hr | 4 mo |
| **Peak** | 2-3 hr | Unknown |
| **Duration** | 75 hr | 4 mo |

## INTERACTIONS
### Individual
Guanethidine, nitroprusside: increased hypotension

### Drug classifications
Antihypertensives, MAOIs, nitrates: increased hypotension
Estrogens, NSAIDs, salicylates: decreased antihypertensive effect

### Drug/herb
Hawthorn: increased antihypertensive effect

### Drug/lab test
Increased: renal function tests
Decreased: Hgb, Hct, RBC

## NURSING CONSIDERATIONS
### Assessment
- Monitor closely; usually given with β-blocker to prevent tachycardia and increased myocardial workload; usually given with diuretic to prevent serious fluid accumulation; patient should be hospitalized during beginning treatment
- Monitor B/P, pulse, jugular venous distention periodically throughout treatment
- Monitor electrolytes, blood studies: potassium, sodium, chloride, CBC, serum glucose
- Monitor weight daily, I&O; assess edema in feet, legs daily; check skin turgor, dryness of mucous membranes for hydration status
- Assess for crackles, dyspnea, orthopnea, peripheral edema, fatigue, weight gain, jugular vein distention (HF)
- Assess for signs of hyperglycemia: acetone breath, increased urinary output, severe thirst, lethargy, dizziness
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not use in breastfeeding

### Patient/family education
**Topical route**
- Teach patient that new hair will be soft and hardly visible, use on clean, dry scalp before styling aids, wash hands after each use
- Caution patient not to use on other parts of the body; product is to be used on the scalp only
- Instruct patient that hair should be clean before applying medication; do not get on clothing
- Caution patient not to get medication near mucous membranes (mouth, nose, eyes) and to contact prescriber if burning, stinging, or rash occurs

### Evaluation
**Positive therapeutic outcome**
- Decreased B/P in hypertension
- Hair growth (TOP)

## mirabegron

(mir′a-beg′ron)
**Myrbetriq**
*Func. class.:* Bladder antispasmodic
*Chem. class.:* $\beta_2$-Adrenergic receptor agonist

**ACTION:** Relaxes smooth muscles in urinary tract

**Therapeutic outcome:** Decreasing dysuria, frequency, nocturia, incontinence

**USES:** Overactive bladder (urinary frequency, urgency), urinary incontinence

### CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, kidney/liver disease, bladder obstruction, dialysis, hypertension

### DOSAGE AND ROUTES

**Adult: PO** 25 mg/day, may increase to 50 mg/day if needed

**Hepatic/renal dose**
**Adult:** PO Child–Pugh B or (CCr 15-29 ml/min, max 25 mg/day; Child–Pugh C or CCr 15 ml/min, not recommended

**Available forms:** Tabs ext rel 25, 50 mg

#### Implementation

- Give whole; take with liquids; do not crush, chew, or break ext rel product; use without regard to meals

### ADVERSE EFFECTS

**CNS:** Fatigue, dizziness, headache
**CV:** Hypertension
**EENT:** Xerophthalmia, blurred vision
**GI:** Nausea, vomiting, anorexia, abdominal pain, constipation, diarrhea, dyspepsia
**GU:** Dysuria, urinary retention, frequency, UTI, bladder discomfort
**INTEG:** Rash, pruritus
**MISC:** Arthralgia, back pain
**RESP:** Pharyngitis
**SYST:** Stevens–Johnson syndrome

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 71% protein binding |
| **Metabolism** | Unknown |
| **Excretion** | 25% unchanged in urine |
| **Half-life** | Terminal 50 hr |

#### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 3.5 hr |
| **Duration** | Unknown |

### INTERACTIONS

#### Individual drugs

CYP3A4 inhibitors: increased mirabegron effect
CYP2D6 substrates: increased effect of these substrates
Digoxin, warfarin, desipramine, thioridazine, flecainide, propafenone: increased effect of these agents

#### Drug classifications

Antimuscarinic agents (e.g., atropine, scopolamine): increased risk of urinary retention

### NURSING CONSIDERATIONS

#### Assessment

- Urinary patterns: Assess for distention, nocturia, frequency, urgency, incontinence
- Monitor LFTs at baseline, periodically
- Monitor B/P

#### Patient/family education

- Teach patient to avoid hazardous activities; dizziness can occur, may take up to 8 wk for full effect
- Advise patient not to drink liquids before bedtime
- Inform patient about the importance of bladder maintenance
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, discontinue breastfeeding or product, excretion unknown

#### Evaluation

**Positive therapeutic outcome**

- Decreasing dysuria, frequency, nocturia, incontinence

## mirtazapine (Rx)

(mer-ta′za-peen)
**Remeron, Remeron Soltab**
*Func. class.:* Antidepressant
*Chem. class.:* Tetracyclic

**ACTION:** Blocks reuptake of norepinephrine, serotonin into nerve endings, increasing action of norepinephrine, serotonin in nerve cells; antagonist of central $\alpha_2$-receptors, blocks histamine receptors; has anticholinergic action

**Therapeutic outcome:** Decreased symptoms of depression after 2-3 wk

**USES:** Depression, dysthymic disorder, bipolar disorder: depression, agitated depression

## CONTRAINDICATIONS

Hypersensitivity to tricyclics, recovery phase of MI, agranulocytosis, jaundice

**Precautions:** Pregnancy, geriatric, suicidal patients, severe depression, increased intraocular pressure, closed-angle glaucoma, urinary retention, cardiac/renal/hepatic disease, hypo/hyperthyroidism, electroshock therapy, elective surgery, seizure disorder, bone marrow suppression, thrombocytopenia

**BLACK BOX WARNING:** Suicidal ideation, children

## DOSAGE AND ROUTES

**Adult:** PO 15 mg/day at bedtime, maintenance to continue for 6 mo, titrate up to 45 mg/day; orally disintegrating tabs open blister pack, place tab on tongue, allow to disintegrate, swallow
**Geriatric:** PO 7.5 mg nightly, increase by 7.5 mg q1-2wk to desired dose, max 45 mg/day

**Available forms:** Tabs 15, 30, 45 mg; orally disintegrating tabs (Soltab) 15, 30, 45 mg

### Implementation

- Administer without regard to meals; crush if patient is unable to swallow medication whole
- Give dose at bedtime if oversedation occurs during day; may take entire dose at bedtime; geriatric may not tolerate once/day dosing
- Store in tight container at room temperature; do not freeze
- Allow **orally disintegrating tablets** to dissolve on tongue; no water needed; do not split; contain phenylalanine
- **Serotonin syndrome, neuroleptic malignant syndrome:** assess for increased heart rate, shivering, sweating, dilated pupils, tremors, high B/P, hyperthermia, headache, confusion; if these occur, stop product, administer a serotonin antagonist if needed; at least 2 wk should elapse between discontinuation of serotoninergic agents and start of this product

## ADVERSE EFFECTS

**CNS:** *Dizziness, drowsiness,* confusion, headache, anxiety, tremors, stimulation, weakness, nightmares, EPS (geriatric), increased psychiatric symptoms, seizures, abnormal dreams
**CV:** *Orthostatic hypotension, ECG changes, tachycardia, hypertension,* palpitations
**EENT:** *Blurred vision,* tinnitus, mydriasis
**GI:** *Diarrhea, dry mouth,* nausea, vomiting, paralytic ileus, increased appetite, cramps, epigastric distress, jaundice, hepatitis, stomatitis, constipation, weight gain
**GU:** *Retention,* acute renal failure, urinary frequency
**HEMA:** Agranulocytosis, thrombocytopenia, eosinophilia, leukopenia
**INTEG:** Rash, urticaria, sweating, pruritus, photosensitivity
**MS:** Back pain, myalgia
**RESP:** Cough
**SYST:** Flulike symptoms, increased lipid levels

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Slow, complete |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Liver, extensively |
| **Excretion** | Feces; breast milk |
| **Half-life** | 20-40 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
CloNIDine: decreased effects
Fenfluramine, dexfenfluramine, sibutramine, nefazodone: increased serotonin syndrome

### Drug classifications

Barbiturates, benzodiazepines, CNS depressants (other): increased effects
MAOIs: hypertensive episode, seizures, hyperpyretic crisis
Sympathomimetics, indirect acting (ePHEDrine): decreased effects
SSRIs, SNRIs, serotonin-receptor agonists: increased serotonin syndrome

### Drug/herb

Kava: increased CNS depression
St. John's wort, SAM-e: serotonin syndrome

### Drug/lab test

Increased: serum bilirubin, blood glucose, alkaline phosphatase
Decreased: VMA, 5-HIAA
False increase: urinary catecholamines

## NURSING CONSIDERATIONS

### Assessment

- Monitor B/P (with patient lying, standing), pulse q4hr during beginning treatment; if systolic B/P drops 20 mm Hg, hold product, notify prescriber; take VS q4hr in patients with CV disease

• Monitor blood studies: CBC, leukocytes, differential, cardiac enzymes if patient is receiving long-term therapy, LFTs, serum creatinine/BUN
• Monitor liver function tests: AST, ALT, bilirubin
• Check weight weekly; product may increase appetite
• Assess ECG for flattening of T wave, bundle branch block, AV block, dysrhythmias in cardiac patients
• Assess for EPS primarily in geriatric: rigidity, dystonia, akathisia
• Assess mental status: mood, sensorium, affect, suicidal tendencies; assess increase in psychiatric symptoms: depression, panic
• Identify alcohol consumption; if alcohol is consumed, hold dose until AM
• **Pregnancy/breastfeeding:** Use only if clearly needed, excreted in breast milk, discontinue product or breastfeeding

### Patient/family education

• Inform patient that therapeutic effects may take 2-3 wk; take at bedtime, do not discontinue abruptly
• Advise patient to use caution in driving and other activities requiring alertness because of drowsiness, dizziness, blurred vision; to avoid rising quickly from sitting to standing, especially geriatric
• Caution patient to avoid alcohol ingestion, other CNS depressants
• Teach patient to increase fluids, bulk in diet if constipation, urinary retention occur, especially geriatric
• Teach patient to use gum, hard sugarless candy, or frequent sips of water for dry mouth
• Advise not to use within 14 days of MAOIs

**BLACK BOX WARNING:** Notify prescriber of suicidal thoughts, behavior

### Evaluation

**Positive therapeutic outcome**

• Decrease in depression
• Absence of suicidal thoughts

## TREATMENT OF OVERDOSE:

ECG monitoring, lavage, administer anticonvulsant

**RARELY USED**

## misoprostol (Rx)

(mye-soe-prost'ole)

**Cytotec**

*Func. class.:* Gastric mucosa protectant; antiulcer

*Chem. class.:* Prostaglandin $E_1$ analog

**Do not confuse:** misoprostol/metoprolol, Cytotec/Cytoxan

## ACTION:

Inhibits gastric acid secretion; may protect gastric mucosa; can increase bicarbonate, mucus production

**Therapeutic outcome:** Prevention of gastric ulcers

## USES:

Prevention of NSAID-induced gastric ulcers

## CONTRAINDICATIONS

Hypersensitivity to this product or prostaglandins

**BLACK BOX WARNING:** Pregnancy, females

**Precautions:** Breastfeeding, children, geriatric, renal disease, CV disease, abnormal fetal position, cardiac/renal/inflammatory bowel disease, C-section, dehydration, diarrhea, fever, ectopic pregnancy, fetal distress, sepsis, vaginal bleeding

## DOSAGE AND ROUTES

**Adult:** PO 200 mcg qid with food for duration of NSAID therapy with last dose at bedtime; if 200 mcg is not tolerated, 100 mcg may be given

**Available forms:** Tabs 100, 200 mcg

### Implementation

• Give with meals for prolonged product effect; avoid use of magnesium antacids
• Store at room temp

## ADVERSE EFFECTS

**GI:** *Diarrhea,* nausea, vomiting, flatulence, constipation, dyspepsia, abdominal pain
**GU:** Spotting, cramps, hypermenorrhea, menstrual disorders

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | ½-1 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ½ hr |
| **Peak** | Unknown |
| **Duration** | 3 hr |

## INTERACTIONS

### Drug/food

Maximum concentrations when taken with food

## NURSING CONSIDERATIONS

### Assessment

• **NSAID-induced ulcer prophylaxis:** monitor patient for GI symptoms: hematemesis, occult or frank blood in stools, also severe abdominal pain, cramping, severe diarrhea

**BLACK BOX WARNING:** Pregnancy: obtain a negative pregnancy test in women of childbearing age before starting medication; miscarriages are common

### Patient/family education

- Advise patient to avoid black pepper, caffeine, alcohol, harsh spices, extremes in temperature of food, which may aggravate condition
- Caution patient to avoid OTC preparations: aspirin, cough, cold preparations; condition may worsen
- Teach patient that product must be continued for prescribed time to be effective and taken exactly as prescribed; doses are not to be doubled
- Instruct patient to report to prescriber diarrhea, black tarry stools, abdominal pain, cramping, menstrual disorders

**BLACK BOX WARNING:** Caution patient to prevent pregnancy while taking this product; spontaneous abortion may occur, pregnancy

### Evaluation

**Positive therapeutic outcome**

- Prevention of ulcers

**⚠ HIGH ALERT**

## mitoMYcin (Rx)

(mye-toe-mye′sin)

**Mutamycin**

*Func. class.:* Antineoplastic, antibiotic

**Do not confuse:** mitoMYcin/mithramycin/mitotane/mitoXANtrone

**ACTION:** Inhibits DNA synthesis, primarily; derived from *Streptomyces caespitosus;* appears to cause cross-linking of DNA; a vesicant

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** Pancreas, stomach, colorectal, bladder cancer

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity, as a single agent, coagulation disorders

**BLACK BOX WARNING:** Thrombocytopenia

**Precautions:** Accidental exposure, acute bronchospasm, anemia, children, dental disease/work, extravasation, females, hemolytic-uremic syndrome, infection, radiation therapy, surgery, vaccines, renal/respiratory disease

**BLACK BOX WARNING:** Bone marrow suppression, hemolytic uremic syndrome, leukopenia, requires a specialized care setting/experienced clinician

## DOSAGE AND ROUTES

**Adult: IV** 10-20 mg/m$^2$ q6-8wk

**Available forms:** Inj 5, 20, 40 mg/vial

### Implementation

**Direct IV route**

- Use cytotoxic handling procedures
- Give antiemetic 30-60 min before product to prevent vomiting
- Use port or central line if possible, product is very irritating to tissues
- Reconstitute 5 mg/10 ml; 20 mg/40 ml; 40 mg/80 ml of sterile water for injection (0.5 mg/ml); shake to dissolve, let stand until completely dissolved; stable for 1 wk at room temperature, 2 wk refrigerated, can be further diluted to 20-40 mcg/ml
- Inject reconstituted injection slowly over 5-10 min **IV** push into free-flowing **IV** infusion of 0.9% NaCl or $D_5W$
- Avoid excessive heat, store reconstituted product in refrigerator, discard after 2 wk, store unreconstituted product at room temp

**Y-site compatibilities:** Allopurinol, amifostine, amphotericin B lipid complex, amphotericin B liposome, anidulafungin, argatroban, atenolol, bivalirudin, bleomycin, caspofungin, CISplatin, cyclophosphamide, DACTINomycin, dolasetron, DOXOrubicin, droperidol, epirubicin, ertapenem, fluorouracil, furosemide, granisetron, heparin, leucovorin, melphalan, methotrexate, metoclopramide, nesiritide, octreotide, ondansetron, oxaliplatin, PACLitaxel, palonosetron, PEMEtrexed, riTUXimab, teniposide, thiotepa, tigecycline, tirofiban, trastuzumab, vinBLAStine, vinCRIStine, voriconazole, zoledronic acid

**Y-site incompatibilities:** Sargramostim, vinorelbine

## ADVERSE EFFECTS

**CNS:** Fever, headache, confusion, drowsiness, syncope, fatigue
**EENT:** Blurred vision
**GI:** *Nausea, vomiting, anorexia, stomatitis,* hepatotoxicity, diarrhea
**GU:** Urinary retention, renal failure, edema
**HEMA:** Thrombocytopenia, leukopenia, anemia
**INTEG:** *Rash,* alopecia, extravasation, nail discoloration
**MISC:** Hemolytic uremic syndrome, HF
**RESP:** Fibrosis, pulmonary infiltrate, dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete bioavailability |
| **Distribution** | Widely distributed; concentrates in tumor |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys, unchanged |
| **Half-life** | 1 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Radiation: increased toxicity

### Drug classifications

Anticoagulants, NSAIDs: increased bleeding risk
Antineoplastics: increased toxicity
Vaccines: avoid concurrent use

### Drug/herb

Black cohosh: avoid use

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Assess for fatal hemolytic uremic syndrome: hypertension, thrombocytopenia, microangiopathic hemolytic anemia; occurs during long-term therapy

- Assess buccal cavity q8hr for dryness, sores or ulceration, white patches, oral pain, bleeding, dysphagia; obtain prescription for viscous lidocaine (Xylocaine)
- **Assess symptoms indicating severe allergic reaction:** rash, pruritus, urticaria, purpuric skin lesions, itching, flushing

**BLACK BOX WARNING: Bone marrow suppression:** Monitor CBC, differential, platelet count weekly; withhold product if WBC is $<4000/mm^3$ or platelet count is $<100,000/mm^3$ or serum creatinine $>1.7$ mg/dl; notify prescriber; bleeding: hematuria, guaiac, bruising, petechiae, mucosa, or orifices

- Monitor renal function tests: BUN, creatinine, serum uric acid, urine CCr before, during therapy; check I&O ratio; report fall in urine output to $<30$ ml/hr; adjust dose based on renal function
- Assess for pulmonary fibrosis, bronchospasm, dyspnea, crackles, unproductive cough, chest pain, tachypnea, fatigue, increased pulse, pallor, lethargy
- Monitor temp q4hr (may indicate beginning of infection)
- **Hepatotoxicity** Monitor liver function tests before, during therapy (bilirubin, AST, ALT, LDH) as needed or monthly; check for jaundiced skin and sclera, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea
- Assess for bleeding: hematuria, stool guaiac, bruising or petechiae, mucosa or orifices q8hr
- Identify effects of alopecia on body image; discuss feelings about body changes
- Identify edema in feet, joint pain, stomach pain, shaking; check for inflammation of mucosa, breaks in skin
- **Pregnancy/breastfeeding:** Do not use in pregnancy or breastfeeding

### Patient/family education

- Advise patient to get adequate fluids 2-3 L/day unless contraindicated
- Encourage patient to rinse mouth tid-qid with water, club soda, brush teeth bid-qid with soft brush or cotton-tipped applicators for stomatitis, use unwaxed dental floss
- Teach patient to avoid use of products containing aspirin or ibuprofen, razors, commercial mouthwash, since bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools)
- Caution patient to report signs of anemia (fatigue, headache, irritability, faintness, shortness of breath)
- Advise patient to report any changes in breathing or coughing even several mo after treatment; to avoid crowds and persons with respiratory tract or other infections
- Teach patient to report signs of IV site reaction, redness, inflammation, burning, pain
- Inform patient that hair may be lost during treatment; a wig or hairpiece may make patient feel better; new hair may be different in color, texture
- **Infection:** teach patient to report fever, flulike symptoms, sore throat
- Advise patient not to have any vaccinations without the advice of the prescriber; serious reactions can occur
- Teach patient that contraception is needed during treatment and for several mo after completion of therapy
- Teach patient to report immediately urine retention, absence of urine, dyspnea, bleeding, jaundice, signs of pulmonary toxicity

### Evaluation

**Positive therapeutic outcome**
- Prevention of rapid division of malignant cells

**⚠ HIGH ALERT**

## mitoXANtrone (Rx)

(mye-toe-zan'trone)
**Novantrone**
*Func. class.:* Antineoplastic-antibiotic, immunomodulator
*Chem. class.:* Synthetic anthraquinone

**Do not confuse:** mitoXANtrone/mitoMYcin/mithramycin/mitotane

**ACTION:** DNA reactive agent; cytocidal effect on both proliferating and nonproliferating cells; topoisomerase II inhibitor; a vesicant

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** Acute myelogenous leukemia (adult), relapsed leukemia, breast cancer, multiple sclerosis; used with steroids to treat bone pain (advanced prostate cancer); multiple sclerosis

**Unlabeled uses:** Liver malignancies, non-Hodgkin's lymphoma, breast cancer, ALL, bone marrow ablation, CLL, hepatocellular cancer, ovarian cancer, pleural effusion, stem cell transplant preparation

## CONTRAINDICATIONS

Pregnancy, hypersensitivity

**Precautions:** Breastfeeding, children, myelosuppression, cardiac/renal/hepatic disease, gout

**BLACK BOX WARNING:** Secondary malignancy, neutropenia, intrathecal administration, extravasation, heart failure

## DOSAGE AND ROUTES

### Acute nonlymphatic leukemia/induction

**Adult: IV** INF 12 mg/m$^2$/day on days 1-3, and 100 mg/m$^2$ cytosine arabinoside × 7 days as a CONT 24-hr INF

### Consolidation

**Adult: IV** INF 12 mg/m$^2$ given as a short 5-15 min INF for 2 days with cytarabine × 5 days

### Advanced prostate cancer

**Adult: IV** 12-14 mg/m$^2$ as a single dose or short INF q21day

### Multiple sclerosis, relapsing

**Adult: IV** INF 12 mg/m$^2$ as a 5-15 min INF q3mo, cumulative lifetime dose 140 mg/m$^2$

**Available forms:** Inj 2, 10, 12.5, 15 mg/ml

### Implementation

- Do not mix with any other product
- Avoid contact with skin, since medication is very irritating; wash completely to remove
- Give fluids **IV** or PO before chemotherapy to hydrate patient
- Give antacid before oral agent; give product after evening meal, before bedtime; provide antiemetic 30-60 min before giving product and prn to prevent vomiting; administer antibiotics for prophylaxis of infection
- Give topical or systemic analgesics for pain
- Liquid diet: carbonated beverages; gelatin may be added if patient is not nauseated or vomiting
- Sol should be prepared by qualified personnel only under controlled conditions in a biological cabinet using mask, gloves, gown
- Use Luer-Lok tubing to prevent leakage; do not let sol come in contact with skin; if contact occurs, wash well with soap and water

**Direct IV route**
- Give after diluting with 50 ml or more of 0.9% NaCl or $D_5W$; give over 3-5 min into running **IV** of $D_5W$ or 0.9% NaCl

**Intermittent IV infusion route**
- May be diluted further in $D_5W$, 0.9% NaCl and run over 15-30 min; check for extravasation

**Continuous IV infusion route**
- Give over 24 hr

**Y-site compatibilities:** Acyclovir, alemtuzumab, alfentanil, allopurinol, amikacin, aminocaproic acid, aminophylline, amiodarone, anidulafungin, argatroban, arsenic trioxide, atracurium, bivalirudin, bleomycin, bretylium, bumetanide, buprenorphine, butorphanol, calcium chloride, calcium gluconate, CARBOplatin, carmustine, caspofungin, cefoTEtan, ceftizoxime, chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, cladribine, codeine, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, DAUNOrubicin citrate liposome, dexmedetomidine, dexrazoxane, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doxacurium, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, erythromycin l, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, fluorouracil, ganciclovir, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, haloperidol, hydrALAZINE, hydrocortisone sodium succinate, HYDROmorphone, hydrOXYzine, ifosfamide, imipenem-cilastatin, inamrinone, insulin, regular, irinotecan, isoproterenol, ketorolac, labetalol,

leucovorin, levofloxacin, levorphanol, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, melphalan, meperidine, meropenem, mesna, metaraminol, methohexital, methotrexate, methyldopate, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, minocycline, mivacurium, morphine sulfate, nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, norepinephrine, octreotide, ondansetron, oxaliplatin, palonosetron, pamidronate, pancuronium, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, polymyxin B, potassium acetate, potassium chloride, procainamide, prochlorperazine, promethazine hydrochloride, propranolol, quiNIDine gluconate, quinupristin-dalfopristin, ranitidine, remifentanil, riTUXimab, rocuronium, sargramostim, sodium acetate, sodium bicarbonate, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, tacrolimus, teniposide, theophylline, thiopental, thiotepa, tigecycline, tirofiban, tobramycin, tolazoline, trastuzumab, trimethobenzamide, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, zidovudine, zoledronic acid

**Y-site incompatibilities:** PACLitaxel

**Additive incompatibilities:** Heparin

**Solution compatibilities:** $D_5$/0.9 NaCl, $D_5W$, 0.9% NaCl

## ADVERSE EFFECTS

**CNS:** Headache, seizures, fatigue
**CV:** HF, cardiomyopathy, dysrhythmias
**EENT:** Conjunctivitis, blue-green sclera, blurred vision
**GI:** *Nausea, vomiting, diarrhea, anorexia, mucositis,* hepatotoxicity, abdominal pain, constipation, jaundice
**GU:** Amenorrhea, menstrual disorders
**HEMA:** Thrombocytopenia, leukopenia, myelosuppression, anemia, secondary leukemia
**INTEG:** *Rash,* necrosis at inj site, alopecia, dermatitis, thrombophlebitis at inj site
**MISC:** Fever, hyperuricemia, infections
**RESP:** Cough, dyspnea
**SYST:** Tumor lysis syndrome, sepsis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Completely absorbed |
| **Distribution** | Widely distributed, protein binding 78% |
| **Excretion** | Bile; kidneys, unchanged (<10%) |
| **Half-life** | 23-215 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Digoxin, phenytoin: increased mitoXANtrone effects
Radiation: increased toxicity, bone marrow suppression
Trastuzumab: increased adverse reactions

### Drug classifications

Anticoagulants, NSAIDs: increased bleeding risk
Antineoplastics: increased toxicity, bone marrow suppression
Live virus vaccines: increased adverse reactions

### Drug/herb

Black cohosh, dong quai: avoid use

### Drug/lab test

Increased: LFTs, uric acid
Decreased: Hct/Hgb, platelets, WBC

## NURSING CONSIDERATIONS

### Assessment

- **Multiple sclerosis:** obtain baseline multigated angiogram, left ventricular ejection fraction (LVEF) if symptoms of HF occur, repeat LVEF or if cumulative dose is >100 mg/m$^2$; do not administer to patients who have received a lifetime dose of ≥140 mg/m$^2$ or if LVEF is <50% or significant decrease in LVEF
- Do not administer in multiple sclerosis if neutrophils <1500/mm$^3$
- Obtain pregnancy test in all women of childbearing age

**BLACK BOX WARNING: Cardiotoxicity**
Monitor ECG; watch for ST-T wave changes, low QRS and T, possible dysrhythmias (sinus tachycardia, heart block, PVCs); also monitor ECHO, MUGA, chest x-ray, RAI angiography to assess ejection fraction before, during treatment; product is cardiotoxic: may develop during treatment or months to years after treatment; risk is greater in cumulative dose >140 mg/m$^2$

- Assess buccal cavity q8hr for dryness, sores or ulceration, white patches, oral pain, bleeding, dysphagia; obtain prescription for viscous lidocaine (Xylocaine)
- **Assess symptoms indicating severe allergic reaction:** rash, pruritus, urticaria, purpuric skin lesions, itching, flushing
- Assess tachypnea, ECG changes, dyspnea, edema, fatigue
- Monitor CBC, differential, platelet count weekly; withhold product if WBC is <1500/mm$^3$;

leukopenia, neutropenia, thrombocytopenia are expected—leukocyte nadir 10-14 days, recovery in 2-3 wk
• Assess for increased uric acid levels, swelling, joint pain primarily in extremities; patient should be well hydrated to prevent urate deposits
• Monitor renal function tests: BUN, creatinine, urine CCr before, during therapy; determine I&O ratio
• Monitor temp q4hr: may indicate beginning of infection
• **Hepatotoxicity:** monitor liver function tests before, during therapy (bilirubin, AST, ALT, LDH) as needed or monthly; dose reduction needed in hepatic disease; check for jaundiced skin and sclera, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea
• **Assess for bleeding:** hematuria, stool guaiac, bruising or petechiae, mucosa or orifices q8hr; check for inflammation of mucosa, breaks in skin
• Identify effects of alopecia on body image; discuss feelings about body changes
• **Assess for multiple sclerosis:** obtain MUGA, LVEF baselines; repeat LVEF if symptoms of HF occur or if cumulative dose is >100 mg/m$^2$; do not give to patients who have received a lifetime dose of ≥140 mg/m$^2$ or if LVEF is <50% or significant LVEF

**BLACK BOX WARNING:** Assess for secondary acute myelogenous leukemia (AML), which can develop after taking this product

• **Pregnancy/breastfeeding:** Do not use in pregnancy or breastfeeding

### Patient/family education

• Encourage patient to rinse mouth tid-qid with water, club soda; brush teeth bid-qid with soft brush or cotton-tipped applicators for stomatitis; use unwaxed dental floss
• Teach patient to avoid use of products containing aspirin or NSAIDs, razors, commercial mouthwash, since bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools)
• Caution patient to report signs of anemia (fatigue, headache, irritability, faintness, shortness of breath)
• Inform patient that hair may be lost during treatment; a wig or hairpiece may make patient feel better; new hair may be different in color, texture
• Caution patient not to have any vaccinations without the advice of the prescriber; serious reactions can occur
• Advise patient that contraception is needed during treatment and for several mo after completion of therapy
• Teach patient to notify prescriber if pregnancy is planned or suspected
• Advise patient that sclera, urine may turn blue or green
• Advise patient to increase fluids to 2-3 L/day unless contraindicated
• Teach patient to avoid crowds, persons with infections
• Teach patient to report immediately bleeding, dyspnea, possible infections, seizure, jaundice, fever, cough or dyspnea

### Evaluation

**Positive therapeutic outcome**
• Prevention of rapid division of malignant cells

## modafinil (Rx)

(mo-daf'i-nil)
**Alertec, Provigil**
*Func. class.:* CNS stimulant
*Chem. class.:* Racemic compound
**Controlled substance IV**

**ACTION:** Similar action as sympathomimetics; does not alter release of dopamine, norepinephrine

**Therapeutic outcome:** Ability to stay awake

**USES:** Narcolepsy, shift work sleep disturbance, obstructive sleep apnea

**Unlabeled uses:** Fatigue in MS, ADHD, symptoms of major depression

## CONTRAINDICATIONS

Hypersensitivity, ischemic heart disease, left ventricular hypertrophy, chest pain, dysrhythmias

**Precautions:** Pregnancy, breastfeeding, child <16 yr, geriatric, unstable angina, history of MI, severe hepatic disease

## DOSAGE AND ROUTES

### To improve wakefulness with daytime sleepiness

**Adult/adolescent ≥16 yr:** PO 200 mg qd

### Hepatic dose (severe hepatic disease)

**Adult:** PO 100 mg qd

### Multiple sclerosis fatigue (unlabeled)

**Adult/elderly/child ≥6 yr:** PO 200-400 mg/day in the AM

### Major depression symptoms (unlabeled)

**Adult:** PO 100 mg/day, max 400 mg/day

### Available forms:

Tabs 100, 200 mg

### Implementation

- Give 1 hr before start of shift work, or in the AM for those with narcolepsy or sleep apnea
- Store at room temperature
- Give without regard to food

## ADVERSE EFFECTS

**CNS:** *Headache,* anxiety, cataplexy, depression, dizziness, insomnia, amnesia, confusion, ataxia, tremors, paresthesia, dyskinesia, suicidal ideation

**CV:** Dysrhythmias, hyper/hypotension, chest pain, vasodilation

**EENT:** Change in vision, *rhinitis,* pharyngitis, epistaxis

**GI:** Nausea, vomiting, changes in LFTs, anorexia, diarrhea, thirst, mouth ulcers

**GU:** Ejaculation disorder, urinary retention, albuminuria

**HEMA:** Eosinophilia

**INTEG:** Rash, dry skin, herpes simplex, Stevens-Johnson syndrome

**MISC:** Infection, hyperglycemia, neck pain

**RESP:** *Dyspnea,* lung changes

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid |
| **Distribution** | 60% protein binding |
| **Metabolism** | Liver (90%) |
| **Excretion** | Unknown |
| **Half-life** | 15 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

CycloSPORINE, theophylline: decreased effects of these drugs

Methylphenidate: delayed effect of modafinil by 1 hr

### Drug classifications

Antidepressants (tricyclics): increased effects

CYP3A4 inhibitors (azole antibiotics, some SSRIs): altered levels of these agents, reaction difficult to predict

CYP2C19 substrates (diazepam, phenytoin, some tricyclics): increased levels of these agents

CYP3A4 inducers (carBAMazepine, phenytoin, rifampin; cycloSPORINE, theophylline): altered levels of these agents

Hormonal contraceptives: decreased effects

### Drug/herb

Coffee, cola nut, guarana, mate, tea: increased stimulation

### Drug/lab test

Increased: eosinophils, glucose, LFTs

## NURSING CONSIDERATIONS

### Assessment

- For narcolepsy, shift work, history of sleep apnea
- For depression, suicidal ideation
- Monitor B/P in those with hypertension
- **Stevens-Johnson syndrome:** Assess for rash, fever, fatigue, blisters; discontinue immediately if these occur, provide supportive therapy
- **Beers:** Avoid in older adults, CNS stimulant effects
- **Pregnancy/breastfeeding:** Only use in pregnancy if clearly needed, use cautiously in breastfeeding, excretion unknown

### Patient/family education

- Advise patient to take only as directed; may be taken with or without food
- Advise patient to use other form of contraception during and at least 30 days after discontinuing medication, if using hormonal birth control; advise patient to notify prescriber if pregnancy is planned or suspected or if breastfeeding
- Advise patient to notify prescriber of allergic reaction, tremors, confusion
- Teach patient to avoid all OTC medications unless approved by prescriber
- Teach patient to avoid hazardous activities until drug effect is known

### Evaluation

**Positive therapeutic outcome**

- Ability to stay awake

## montelukast (Rx)

(mon-teh-loo'kast)

**Singulair**

*Func. class.:* Bronchodilator

*Chem. class.:* Leukotriene antagonist, cysteinyl

**Do not confuse:** Singulair/SINEquan

**ACTION:** Inhibits leukotriene ($LTD_4$) formation; leukotrienes exert their effects by increasing neutrophil, eosinophil migration; aggregation of

neutrophils, monocytes; smooth muscle contraction, capillary permeability; these actions further lead to bronchoconstriction, inflammation, edema

**Therapeutic outcome:** Ability to breathe with ease

## USES:
Chronic asthma in adults and children, seasonal allergic rhinitis, bronchospasm prophylaxis

**Unlabeled uses:** Chronic urticaria

## CONTRAINDICATIONS
Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children <6 yr, acute attacks of asthma, alcohol consumption, severe hepatic disease, corticosteroid withdrawal, phenylketonuria, suicidal ideation, depression

## DOSAGE AND ROUTES
### Asthma
**Adult and child ≥15 yr:** PO 10 mg/day PM
**Child 6-14 yr:** PO 5 mg chew tabs/day PM
**Child 2-5 yr:** PO (chew tabs, granules) 4 mg/day
**Child 12-23 mo:** PO 1 packet of granules taken PM

### Exercise-induced bronchoconstriction
**Adult/child ≥6 yr:** PO 10 mg 2 hr prior to exercise; do not take another dose within 24 hr

**Available forms:** Tabs 10 mg; chewable tabs 4, 5 mg; oral granules 4 mg/packet

### Implementation
**PO route**
- Give PO in PM daily for all uses except exercise-induced bronchoconstriction; then take 2 hr prior to exercise
- Do not open packet until ready to use; mix whole dose, give within 15 min
- Granules may be given directly in mouth or mixed with a spoonful of soft food (carrots, applesauce, ice cream, rice)

## ADVERSE EFFECTS
**CNS:** Dizziness, fatigue, headache, behavior changes, seizures, agitation, anxiety, depression, fever, hallucinations, drowsiness, suicidal ideation, memory impairment, hostility, somnambulism
**GI:** Abdominal pain, dyspepsia, nausea, vomiting, diarrhea, pancreatitis
**HEMA:** Thrombocytopenia
**INTEG:** Rash, pruritus, erythema
**MS:** Asthenia, myalgia, muscle cramps
**RESP:** Influenza, cough, nasal congestion
**SYST:** Anaphylaxis, angioedema, Churg-Strauss syndrome, Stevens-Johnson syndrome, toxic epidermal necrolysis

### Pharmacokinetics
| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Protein binding 99% |
| **Metabolism** | Liver |
| **Excretion** | Bile |
| **Half-life** | 2.7-5.5 hr |

### Pharmacodynamics
| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 3-4 hr |
| **Duration** | Unknown |

## INTERACTIONS
### Individual drugs
Rifabutin, rifapentine, carBAMazepine, fosphenytoin, phenytoin, rifampin: decreased montelukast levels

### Drug classifications
Barbiturates: decreased montelukast levels

### Drug/herb
Tea (green, black), guarana: increased stimulation

### Drug/lab test
Increased: ALT, AST

## NURSING CONSIDERATIONS
### Assessment
- Assess adult patients carefully for symptoms of Churg-Strauss syndrome (rare), including eosinophilia, vasculitic rash, worsening pulmonary symptoms, cardiac complications and/or neuropathy
- Monitor CBC, blood chemistry during treatment
- Assess for behavior changes and suicidal ideation, other neuropsychiatric reactions
- **Severe hepatic disease:** use cautiously
- **Anaphylaxis, Stevens-Johnson syndrome:** Assess for rash, fever, blisters, fatigue, muscle/joint aches, if these occur discontinue, provide supportive therapy
- **Pregnancy/breastfeeding:** Use in pregnancy only if clearly needed, use cautiously in breastfeeding, excretion unknown

### Patient/family education
- Advise patient to avoid hazardous activities; dizziness may occur
- Teach patient that product is not to be used for acute asthma attacks
- Advise patient to avoid NSAIDs if sensitive to aspirin

• Advise patient to continue to use inhaled β-agonists if exercise-induced asthma occurs
• **Granules:** instruct patient to take directly by mouth or mixed in a spoonful of room temperature soft food (use only applesauce, carrots, rice, or ice cream); use within 15 min of opening packet, discard used portions

### Evaluation

**Positive therapeutic outcome**
• Increased ease of breathing
• Decreased bronchospasm

**⚠ HIGH ALERT**

## morphine (Rx)

(mor'feen)
**Astramorph PF, Depo Dur, Infumorph PF, Kadian, M.O.S. 🍁, Duramorph PH, Statex 🍁**
*Func. class.:* Opioid analgesic
*Chem. class.:* Alkaloid
**Controlled substance schedule II**

**Do not confuse:** morphine/HYDROmorphone, MS Contin/oxyCONTIN

**ACTION:** Depresses pain impulse transmission at the spinal cord level by interacting with opioid receptors

**Therapeutic outcome:** Decreased pain

**USES:** Moderate to severe pain

**Unlabeled uses:** Agitation, bone/dental pain, dyspnea in end-stage cancer or pulmonary disease, sedation induction, rapid-sequence intubation

## CONTRAINDICATIONS

Hypersensitivity, addiction (opioid/alcohol), hemorrhage, bronchial asthma, increased ICP, paralytic ileus, hypovolemic shock, MAOI therapy

**BLACK BOX WARNING:** Respiratory depression

**Precautions:** Pregnancy, breastfeeding, children <18 yr, geriatric, addictive personality, acute MI, severe heart disease, renal/hepatic disease, bowel impaction, abrupt discontinuation, seizures

**BLACK BOX WARNING:** Accidental exposure, epidural/intrathecal/IM/subcut administration, opioid-naive patients, substance abuse

## DOSAGE AND ROUTES

### Acute moderate to severe pain

#### >> PO regular-release

**Adult ≥50 kg:** Initially, 10-30 mg q3-4hr as needed
**Adult <50 kg/geriatric patient:** May require lower doses and/or extended dosing intervals; doses should be titrated carefully
**Child/infant ≥6 mo:** 0.2-0.5 mg/kg q4-6hr as needed
**Infant <6 mo/neonate:** 0.1 mg/kg PO q3-4hr

#### >> IV/IM/subcut

**Adult ≥50 kg:** 2.5-15 mg q2-6hr as needed, titrate or a loading dose of 0.05-0.1 mg/kg **IV**, followed by 0.8-10 mg/hr **IV**, titrate
**Adult <50 kg/geriatric patient:** May require lower doses and/or extended dosing intervals 0.1 mg/kg q3-4hr, titrate
**Child/infant ≥6 mo:** 0.05-0.2 mg/kg q2-4hr, titrate to relief max initial doses 15 mg/dose
**Neonate/infant <6 mo:** 0.03-0.05 mg/kg q3-8hr, titrate to relief

#### >> Epidural (morphine sulfate injection, but NOT DepoDur)

**Adult:** Initially, 5 mg in the lumbar region; if pain relief does not occur in 1 hr, give 1-2 mg epidurally; max 10 mg/24 hr; **continuous epidural infusion,** 2-4 mg/24 hr; may give another 1-2 mg

#### >> Intrathecal dosage (morphine sulfate injection, but NOT DepoDur)

Do not inject >2 ml of the 0.5 mg/ml or 1 ml of the 1 mg/ml ampule
**Adult:** 0.2-1 mg in the lumbar area as a single dose or to establish dosage for continuous intrathecal infusion; repeated injections are not recommended

#### >> Rectal dosage

**Adult:** 10-20 mg PR q4hr, as needed
**Child:** Individualize

### Chronic moderate and severe pain

• Do not use extended-release cap or tab as prn analgesics, for acute pain, or if the pain is mild or not expected to persist for an extended period of time. Use for postoperative pain only if the patient is receiving chronic opioid therapy prior to surgery or if the postoperative pain is expected to be moderate to severe and persist for an extended period of time. Do not use controlled-release tablets (MS Contin) immediately after surgery (for the first 24 hr) in patients not previously taking the drug

• **Do not use in opioid-naive patients:** 100 mg, 130 mg, 150 mg, 200 mg morphine extended-release capsules (Kadian), 100 mg, 200 mg morphine control-release tablets (MS Contin); patients considered opioid tolerant are those who are taking at least 60 mg/day oral morphine, 30 mg/day of oral oxyCODONE, 8 mg/day oral HYDROmorphone, or an equal dose of another opioid, for a wk or longer

### >> PO [extended-release tab (MS Contin, Oramorph SR) or caps (Kadian)] (opiate naïve)

**Adult:** 15-30 mg q12hr (tabls); 10 mg bid or 20 mg/day (Kadian); titrate; Kadian should be increased ≤20 mg q1-2 days, taper gradually; to discontinue, gradually decrease Kadian over 2-4 days

**Child (unlabeled):** 0.3-0.6 mg/kg q12hr (tablets)

### >> IV/subcut route (opiate naïve)

**Adult: IV** 2-10 mg loading dose, then 0.8-10 mg/hour **IV,** titrate; maintenance 0.8-80 mg/hour **IV**

**Child/infant ≥6 mo: IV** Initially, 0.04-0.07 mg/kg/hr (range: 0.025-2.6 mg/kg/hr), **Subcut inf** 0.025-0.179 mg/kg/hr

**Infant <6 mo/neonate: IV** 0.01 mg/kg/hour **IV,** initially, infusion rates max 0.015-0.02 mg/kg/hour **IV**

## Breakthrough pain in patients receiving long-acting or continuous infusion morphine

### >> PO (regular-release)

**Adult/child:** The dose is usually one-fourth to one-third the 8- to 12-hour extended-release dose q4-6hr as needed

**Adult/child:** For PCA, intermittent dose is usually 25%-30% of the hourly rate IV/SC q6-15min as needed; intermittent IV injection dosage is 25%-30% of the hourly rate given IV/SC q1-2hr as needed

**Available forms: HCL:** suppositories 10, 20, 30 mg; syrup 1, 5, 10, 20, 50 mg/ml; tabs 10, 20, 40, 60 mg; **Sulfate:** caps ext rel microgranules 10, 15, 30, 60, 100, 200 mg; caps ext rel pellets (Kadian) 10, 20, 30, 40, 50, 60, 70, 80, 100, 130, 150, 200 mg; drops: 20, 50 mg/ml; injection epidural: 0.5, 1, 10, 15 mg/ml; injection (Preservative): 0.5, 1, 2, 10, 15, 25, 50 mg/ml; injection (Corpuject/prefilled syringes): 2, 4, 8, 10, 15 mg/ml; oral solution 10, 20 mg/ml, 20 mg/ml (concentrate); suppositories 5, 10, 20, 30 mg; syrup 1, 5, 10 mg/ml; tab 5, 10, 15, 25, 30, 50 mg; tabs ext rel 15, 30, 60, 100, 200 mg

## Implementation

### >> PO route

• Give with food or milk to minimize GI effects

**Immediate-release cap**

• May swallow whole, or opened and contents sprinkled on cool food (pudding or applesauce), or added to juice (given immediately) or delivered via gastric or NG tube by either adding to or following with liquid

**Extended-release and controlled-release tabs**

• Swallow whole; do not crush, break, dissolve, or chew.

• The use of MS Contin 100 mg or 200 mg tabs should be limited to opioid-tolerant patients requiring oral doses equivalent to ≥200 mg/day. Use of the 100 mg or 200 mg tablet is only recommended for patients who have already been titrated to a stable analgesic regimen using lower strengths of MS Contin or other opioids

**Sustained-release caps**

• Swallow; do not chew, crush, or dissolve

• Caps may be opened and contents sprinkled on applesauce (at room temperature or cooler) immediately prior to ingestion. Do not chew, crush, or dissolve the pellets/beads inside the cap. The applesauce should be swallowed without chewing. If the pellets/beads are chewed, an immediate release of a potentially fatal morphine dose may be delivered. Rinse mouth to ensure all the pellets/beads have been swallowed. Do not separate applesauce into separate doses; the entire portion should be taken. Discard unused portion

• Kadian caps may be given through a 16 French gastrostomy tube; flush with water, and sprinkle the cap contents into 10 ml of water. Using a funnel and a swirling motion, pour the pellets and water into the tube. Rinse the beaker with 10 ml of water, and pour the water into the funnel. Repeat until no pellets remain in the beaker

• Do NOT administer Kadian through a nasogastric tube

• Consumption of alcohol while taking the ext rel capsules may result in the rapid release and absorption of a potentially fatal dose of morphine

• Kadian 100 mg, 130 mg, 150 mg or 200 mg caps should be given only to opioid tolerant patients

• Begin with immediate release products and titrate to correct dose and convert to a sustained release product

**Oral liquid**
• Check dose prior to use; many concentrations of oral sol are available; may be diluted in fruit juice; protect from light

## >> Injectable administration

• Visually inspect for particulate matter and discoloration before use; do not use if a precipitate is present after shaking; do not use the Duramorph solution if a precipitate is present or if the color is darker than pale yellow

**IV route**
• Prior or to use, an opiate antagonist and emergency facilities should be available
• Do not use the highly concentrated morphine injections (i.e., 10-25 mg/ml) for IV, IM, or SC administration of single doses. These injection solutions are intended for use via continuous, controlled-microinfusion devices

**Direct IV route**
• Dilute dose with ≥5 ml of sterile water for injection or NS injection
• Inject 2.5-15 mg directly into a vein or into the tubing of a freely flowing IV solution over 4-5 min; do not give rapidly

**Continuous IV infusion**
• Dilute in 5% dextrose; use a controlled-infusion device
• Adjust dose and rate based on patient response

**Patient-controlled analgesia (PCA)**
• A compatible patient-controlled infusion device must be used
• Dilute solutions to obtain a concentration of 1 or 10 mg/ml for ease in calculations and programming of PCA pumps
• Adjust dose and rate based on patient response. Consult the patient-controlled infusion device manual for directions on rate of infusion

**Subcut route**
• Inject taking care not to inject intradermally

**Continuous SC infusion**
• Morphine is not approved by the FDA for subcut use
• Dilute to an appropriate concentration in $D_5W$; administer using a portable, controlled, subcut device; adjust rate based on patient response and tolerance
• Max subcut rate 2 ml/hr/site

**Intrathecal/epidural route**
• Morphine sulfate injection is not interchangeable with morphine sulfate extended-release liposome injection (DepoDur), DepoDur is only for epidural administration
• Do not use Infumorph (10 mg/ml or 25 mg/ml) for single-dose neuraxial injection because lower doses can be more reliably administered with Duramorph (0.5 mg/ml or 1 mg/ml)

## >> Rectal route

• Moisten the suppository with water prior to insertion. If suppository is too soft, chill in the refrigerator for 30 min or run cold water over it before removing the wrapper

## >> Oral solid formulations

**Immediate-release capsules administration**
• May be swallowed whole or opened and the contents sprinkled on cool food such as pudding or applesauce
• Capsule contents may be added to juice and administered immediately or delivered via gastric or NG tube by either adding to or following with liquid

## >> Extended-release and controlled-release tablets administration

• Swallow whole; do not crush, break, dissolve, or chew
• The use of MS Contin 100 mg or 200 mg tablets should be limited to opioid-tolerant patients requiring oral doses equivalent to ≥200 mg/day. Use of the 100 mg or 200 mg tablet is only recommended for patients who have already been titrated to a stable analgesic regimen using lower strengths of MS Contin or other opioids

**Sustained-release capsule administration**
• Capsules should be swallowed; do not chew, crush, or dissolve
• Capsules may be opened and the contents sprinkled on applesauce (at room temperature or cooler) immediately prior to ingestion; no other food has been tested. Do not chew, crush, or dissolve the pellets/beads inside the capsule. The applesauce needs to be swallowed without chewing. If the pellets/beads are chewed, an immediate release of a potentially fatal morphine dose may be delivered. Rinse mouth to ensure all the pellets/beads have been swallowed. Do not separate applesauce into separate doses; the entire portion should be taken. Discard any unused portion of the capsules after the contents have been sprinkled on the applesauce
• Kadian capsules may be administered through a 16 French gastrostomy tube. Flush the tube with water, and sprinkle the capsule contents into 10 ml of water. Using a funnel and a swirling motion, pour the pellets and water into the tube. Rinse the beaker with 10 ml of water, and pour the water into the funnel. Repeat until no pellets remain in the beaker
• Do NOT administer Kadian through a nasogastric tube
• Consumption of alcohol while taking the extended-release capsules may result

in the rapid release and absorption of a potentially fatal dose of morphine
• Kadian 100 mg, 130 mg, 150 mg or 200 mg capsules should be limited to opioid tolerant patients

## >> Oral liquid formulations

**Oral solution administration**

• Carefully check dose prior to dispensing medication as many concentrations of morphine oral solution are available
• May be diluted in fruit juice prior to administration
• Protect from light

**Injectable administration**

• Visually inspect parenteral products for particulate matter and discoloration prior to administration whenever solution and container permit. Unopened solutions should be discarded if a precipitate is present that does not disappear with shaking. Do not use the Duramorph solution if a precipitate is present or if the color is darker than pale yellow

## >> Intravenous administration

• Prior to administration, an opiate antagonist and facilities for administration of oxygen and control of respiration should be available
• Do not use the highly concentrated morphine injections (i.e., 10-25 mg/ml) for IV, IM, or SC administration of single doses. These injection solutions are intended for use via continuous, controlled-microinfusion devices

**Direct IV injection**

• Dilute appropriate dose with at least 5 ml of sterile water for injection or NS injection
• Inject 2.5-15 mg directly into a vein or into the tubing of a freely flowing IV solution over 4-5 minutes. Rapid IV injection of morphine may result in an increased frequency of adverse effects. For example, the maximum CNS effects occur 30 minutes after administration. Rapid intravenous administration could result in an overdose

**Continuous IV infusion**

• Dilute in 5% dextrose
• Administer using a controlled-infusion device
• Adjust dose and rate based on patient response

**Patient-controlled analgesia (PCA)**

• A compatible patient-controlled infusion device must be used
• Dilute solutions to obtain morphine concentration of 1 or 10 mg/ml for ease in calculations and programming of PCA pumps
• Adjust dose and rate based on patient response. Consult the patient-controlled infusion device operator's manual for directions on administering the drug at the desired rate of infusion

## >> Subcutaneous administration

• Inject subcutaneously taking care not to inject intradermally

**Continuous SC infusion**

• Morphine is not approved by the FDA for subcutaneous administration
• Dilute to an appropriate concentration in $D_5W$ and administer using a portable, controlled, subcutaneous infusion device. Adjust rate based on patient response and tolerance
• Maximum SC rate of infusion is 2 ml/hour/site

## >> Intrathecal administration

• Intrathecal dose is approximately one-tenth (1/10) the epidural dose
• Morphine sulfate injection is not interchangeable with morphine sulfate extended-release liposome injection (DepoDur). DepoDur is only for epidural administration (see below)
• Do not use Infumorph (10 mg/ml or 25 mg/ml) for single-dose neuraxial injection because lower doses can be more reliably administered with Duramorph (0.5 mg/ml or 1 mg/ml)
• Epidural or intrathecal administration should only be used by specially trained healthcare professionals
• May be given as intermittent bolus, continuous infusion, or as patient-controlled epidural analgesia. Infumorph is only indicated for intrathecal or epidural infusion; Infumorph is not recommended for single-dose intravenous, intramuscular, or subcutaneous administration because of the very large amount of morphine in the ampul and the associated overdosage risk
• Prior to administration, an opiate antagonist and facilities for administration of oxygen and control of respiration should be available. The patient should be in a setting where adequate monitoring is possible. Immediate availability of naloxone injection and resuscitative equipment is also needed during Infumorph reservoir refilling or reservoir manipulation
• Placement of epidural catheter and administration should be at a site near the dermatomes covering the field of pain to decrease dose requirements and increase specificity. For example, for thoracic surgery placement at T2-T8, upper abdominal surgery, T4-L1, lower abdominal surgery, T10-L3, upper extremity surgery, C2-C8 and lower extremity surgery, T12-L3
• Visually inspect parenteral products for particulate matter and discoloration prior to administration whenever solution and container permit. Unopened Infumorph solution should be discarded if a precipitate is present that does not disappear with shaking or if it is not colorless or pale yellow. Do not use the Duramorph

solution if a precipitate is present or if the color is darker than pale yellow

**Intrathecal injection (morphine sulfate injection)**

- No more than 2 or 1 ml of the injection containing 0.5 or 1 mg/ml, respectively, should be injected intrathecally
- After ensuring proper placement of the needle or catheter, inject appropriate dose intrathecally. Monitor patient in a fully equipped and staffed environment for at least 24 hr after each dose, as severe respiratory depression may occur up to 24 hr after drug administration. Repeated intrathecal injections are not recommended other than for establishing initial intrathecal dosage for continuous intrathecal infusion

**Continuous intrathecal infusion (morphine sulfate injection)**

- Intrathecal dose is approximately one-tenth (1/10) the epidural dose. Epidural dose is usually considered to be one-tenth (1/10) the IV dose
- A controlled-infusion device must be used. For highly concentrated injections, an implantable controlled-microinfusion device is used. Patients should be monitored in a fully equipped and staffed environment for several days following implantation of the device
- If dilution of the injection is necessary, NS injection is recommended
- The infusion device reservoir should only be filled by fully trained and qualified healthcare professionals. Strict aseptic technique must be used. Withdraw dose from the ampul through a 5-µm (or smaller pore diameter) microfilter to avoid contamination with glass or other particles. Ensure proper placement of the needle when filling the reservoir to avoid accidental overdosage
- To avoid exacerbation of severe pain and/or reflux of CSF into the reservoir, depletion of the reservoir should be avoided

## >> Other injectable administration

**Epidural administration**

- Intrathecal dose is approximately one-tenth (1/10) the epidural dose. Epidural dose is usually considered to be one-tenth (1/10) the IV dose
- Morphine sulfate injection is not interchangeable with morphine sulfate extended-release liposome injection (DepoDur). DepoDur is only for epidural administration (see below)
- Do not use Infumorph (10 mg/ml or 25 mg/ml) for single-dose neuraxial injection because lower doses can be more reliably administered with Duramorph (0.5 mg/ml or 1 mg/ml)
- Epidural administration should only be used by specially trained healthcare professionals
- May be given as intermittent bolus, cont inf, or as patient-controlled epidural analgesia. Infumorph is only indicated for intrathecal or epidural infusion; Infumorph is not recommended for single-dose intravenous, intramuscular, or subcutaneous administration because of the very large amount of morphine in the ampul and the associated overdosage risk
- Prior to administration, an opiate antagonist and facilities for administration of oxygen and control of respiration should be available. The patient should be in a setting where adequate monitoring is possible. Immediate availability of naloxone injection and resuscitative equipment is also needed during Infumorph reservoir refilling or reservoir manipulation
- Placement of epidural catheter and administration should be at a site near the dermatomes covering the field of pain to decrease dose requirements and increase specificity. For example, for thoracic surgery placement at T2-T8, upper abdominal surgery, T4-L1, lower abdominal surgery, T10-L3, upper extremity surgery, C2-C8 and lower extremity surgery, T12-L3

**Epidural injection (morphine sulfate injection)**

- After ensuring proper placement of the needle or catheter, inject appropriate dose into the epidural space. Monitor patient in a fully equipped and staffed environment for at least 24 hr after each dose, as severe respiratory depression may occur up to 24 hr after drug administration

**Continuous epidural infusion (morphine sulfate injection)**

- Intrathecal dose is approximately one-tenth (1/10) the epidural dose. Epidural dose is usually considered to be one-tenth (1/10) the IV dose
- A controlled-infusion device must be used. For highly concentrated injections, an implantable controlled-microinfusion device is used. Patients should be monitored in a fully equipped and staffed environment for several days following implantation of the device
- If dilution of the injection is necessary, NS injection is recommended
- The infusion device reservoir should only be filled by fully trained and qualified healthcare professionals. Strict aseptic technique must be used. Withdraw dose from the ampul through a 5-µm (or smaller pore diameter) microfilter to avoid contamination with glass or other particles. Ensure proper placement of the needle when filling the reservoir to avoid accidental overdosage
- To avoid exacerbation of severe pain and/or reflux of CSF into the reservoir, depletion of the reservoir should be avoided

### >> Epidural administration (morphine sulfate extended-release liposome injection [DepoDur] ONLY)

- Morphine sulfate ext rel liposome injection (DepoDur) is not interchangeable with other morphine sulfate injections
- DepoDur is only for epidural administration. Do not administer by any other parenteral route
- Epidural administration should only be used by specially trained healthcare professionals
- Prior to administration, an opiate antagonist and facilities for administration of oxygen and control of respiration should be available. The patient should be in a setting where adequate monitoring is possible. Monitor patient in a fully equipped and staffed environment for at least 48 hr after each dose, as severe respiratory depression may occur
- Invert the vial to resuspend particles immediately before withdrawal. Administer DepoDur within 4 hr after withdrawal from the vial when kept at controlled room temperature 59-86° F (15-30° C). The product does not contain any bacteriostatic agents or preservatives. Do not heat- or gas-sterilize

**Epidural injection [morphine sulfate extended-release liposome injection (DepoDur)]**

- Placement of epidural needle or catheter and administration should be at the lumbar level. Due to lack of study data, administration of DepoDur at the thoracic level or higher is not recommended
- Determine proper needle or catheter placement by aspiration to check for blood or cerebrospinal fluid and/or by administration of a test dose of 3 ml of 1.5% preservative-free lidocaine and EPINEPHrine (1:200,000). If tachycardia or sudden onset of segmental anesthesia occurs, the needle or catheter is in the intrathecal space and thus, needs to be repositioned. If a test dose is given, flush the catheter with 1 ml of preservative-free normal saline injection and wait at least 15 minutes after test dose administration before administration of DepoDur
- Inject DepoDur at the lumbar level undiluted or diluted up to 5 ml total volume with preservative-free normal saline. During administration, do not use an inline filter or mix DepoDur with any medication. Additionally, do not administer any medication into the epidural space within 48 hr of DepoDur receipt

### >> Rectal administration

- Instruct patient on proper use of suppository (see Patient Information)
- Moisten the suppository with water prior to insertion. If suppository is too soft because of storage in a warm place, chill in the refrigerator for 30 minutes or run cold water over it before removing the wrapper

**Y-site compatibilities:** Acetaminophen, aldesleukin, allopurinol, amifostine, amikacin, aminophylline, amiodarone, atenolol, atracurium, aztreonam, bumetanide, calcium chloride, cefamandole, ceFAZolin, cefotaxime, cefoTEtan, cefOXitin, ceftAZidime, ceftizoxime, ceftRIAXone, cefuroxime, cephalothin, chloramphenicol, cladribine, clindamycin, cyclophosphamide, cytarabine, dexamethasone, digoxin, diltiazem, DOBUTamine, DOPamine, doxycycline, enalaprilat, EPINEPHrine, erythromycin, esmolol, etomidate, famotidine, fentaNYL, filgrastim, fluconazole, fludarabine, foscarnet, gentamicin, granisetron, heparin, hydrocortisone, HYDROmorphone, kanamycin, labetalol, lidocaine, LORazepam, magnesium sulfate, melphalan, meropenem, methotrexate, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, nafcillin, niCARdipine, nitroglycerin, norepinephrine, ondansetron, oxacillin, oxytocin, PACLitaxel, pancuronium, penicillin G potassium, piperacillin, piperacillin/tazobactam, potassium chloride, propranolol, ranitidine, sodium bicarbonate, teniposide, thiotepa, ticarcillin, ticarcillin/clavulanate, tigecycline, tobramycin, vancomycin, vecuronium, vinorelbine, vit B/C, warfarin, zidovudine, zoledronic acid

**Y-site incompatibilities:** Furosemide, minocycline, tetracycline

## ADVERSE EFFECTS

**CNS:** Drowsiness, dizziness, *confusion,* headache, *sedation,* euphoria, insomnia, seizures
**CV:** Palpitations, bradycardia, change in B/P, shock, cardiac arrest, chest pain, hyper/hypotension, edema, tachycardia
**EENT:** Blurred vision, miosis, diplopia
**ENDO:** Gynecomastia
**GI:** Nausea, vomiting, anorexia, *constipation,* cramps, biliary tract pressure
**GU:** Urinary retention, impotence, gonadal suppression
**HEMA:** Thrombocytopenia
**INTEG:** Rash, urticaria, bruising, flushing, diaphoresis, pruritus
**RESP:** Respiratory depression, respiratory arrest, apnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Variably absorbed (PO); well absorbed (IM, SUBCUT, RECT); completely absorbed (**IV**) |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys |
| **Half-life** | 1½-2 hr; IM 3-4 hr; AVINza 24 hr; Kadian 11-13 hr |

### Pharmacodynamics

| | PO | PO EXT REL | IM | SUBCUT | RECT | IV | IT |
|---|---|---|---|---|---|---|---|
| **Onset** | Variable | Unknown | 10-30 min | 20 min | Unknown | Rapid | Rapid |
| **Peak** | 1 hr | Unknown | 30-60 min | 1-1½ hr | ½-1 hr | 20 min | Unknown |
| **Duration** | 4-5 hr | 8-12 hr | 4-5 hr | 4-5 hr | 3-7 hr | 4-5 hr | Ext |

## INTERACTIONS

### Individual drugs

Alcohol: increased effects with other CNS depressants

Rifampin: decreased analgesic action

### Drug classifications

Antipsychotics, opiates, sedative-hypnotics, skeletal muscle relaxants: increased effects with other CNS depressants

MAOIs: unpredictable reaction may occur; avoid use

### Drug/herb

Chamomile, hops, kava, St. John's wort, valerian: increased CNS depression

### Drug/lab test

Increased: amylase

## NURSING CONSIDERATIONS

### Assessment

- Assess pain: location, type, character, intensity; give dose before pain becomes extreme
- Monitor I&O ratio; check for decreasing output; may indicate urinary retention; check for constipation; increase fluids, bulk in diet if needed, or stimulant laxatives may be prescribed; monitor serum sodium

**BLACK BOX WARNING:** Abrupt discontinuation: gradually taper to prevent withdrawal symptoms; decrease by 50% q1-2 days, avoid use of narcotic antagonist

- Monitor CNS changes: dizziness, drowsiness, hallucinations, euphoria, LOC, pupil reactions
- Monitor allergic reactions: rash, urticaria

**BLACK BOX WARNING:** Accidental exposure: if Duramorph or Infamorph gets on skin, remove contaminated clothing and rinse affected area with water

**BLACK BOX WARNING:** Assess respiratory dysfunction: depression, character, rate, rhythm; notify prescriber if respirations are <12/min; accidental overdose has occurred with high-potency oral sol

- **Pregnancy/breastfeeding:** Only use if benefits outweigh fetal risk, use can result in opioid withdrawal syndrome, do not use in breastfeeding

### Patient/family education

- Advise patient to report any symptoms of CNS changes, allergic reactions
- Caution patients to avoid CNS depressants (alcohol, sedative/hypnotics) for at least 24 hr after taking this product
- Discuss with patient that dizziness, drowsiness, and confusion are common; to avoid getting up without assistance
- Discuss in detail all aspects of the product and expected response

### Evaluation

**Positive therapeutic outcome**

- Decreased pain

## TREATMENT OF OVERDOSE:

Naloxone (Narcan) 0.2-0.8 **IV** (caution with opioid-tolerant individuals), $O_2$, **IV** fluids, vasopressors



## moxifloxacin (Rx)

(mox-i-floks'a-sin)

**Avelox, Avelox IV, Moxeza, Vigamox**

*Func. class.:* Antiinfective

*Chem. class.:* Fluoroquinolone

**Do not confuse:** moxifloxacin/gatifloxacin/ciprofloxacin/levoFLOXacin

**ACTION:** Interferes with conversion of intermediate DNA fragments into high molecular weight DNA in bacteria; DNA gyrase inhibitor

**Therapeutic outcome:** Bactericidal action against the following: *Staphylococcus aureus, Streptococcus pneumoniae, Haemophilus influenzae, Haemophilus parainfluenzae, Moraxella catarrhalis, Klebsiella pneumoniae, Mycoplasma pneumoniae, Chlamydia pneumoniae; Streptococcus pyogenes, Escherichia coli, Bacteroides fragilis, Streptococcus anginosus, Streptococcus constellatus, Enterococcus faecalis, Proteus mirabilis, Clostridium perfringens, Bacteroides thetalomicron, Peptostreptococcus, Enterobacter cloacae*

**USES:** Acute bacterial sinusitis, acute bacterial exacerbation of chronic bronchitis, community-acquired pneumonia (mild to moderate), uncomplicated skin/skin structure infections, complicated intraabdominal infections including

polymicrobial infections, complicated skin/skin structure infections

**Unlabeled uses:** Anthrax treatment/prophylaxis, gastroenteritis, MAC, nongonococcal urethritis, shigellosis, surgical infection prophylaxis, TB

## CONTRAINDICATIONS

Hypersensitivity to quinolones

**Precautions:** Pregnancy, breastfeeding, children, renal/hepatic/cardiac disease, epilepsy, uncorrected hypokalemia, prolonged QT interval, patients receiving class IA, III antidysrhythmics, GI disease, seizure disorder, pseudomembranous colitis, diabetes mellitus

**BLACK BOX WARNING:** Tendon pain/rupture, tendinitis, myasthenia gravis

## DOSAGE AND ROUTES

### Acute bacterial sinusitis

**Adult:** PO/**IV** 400 mg q24hr × 10 days

### Acute bacterial exacerbation of chronic bronchitis

**Adult:** PO/**IV** 400 mg q24hr × 5 days

### Community-acquired pneumonia

**Adult:** PO/**IV** 400 mg q24hr × 7-14 days

### Uncomplicated skin/skin structure infections

**Adult:** PO/**IV** 400 mg q24hr × 7 days

### Complicated intraabdominal infections

**Adult:** **IV** 400 mg/day × 5-14 days

### Complicated skin/skin structure infections

**Adult:** PO/**IV** 400 mg/day × 7-21 days

**Available forms:** Tabs 400 mg; inj premix 400 mg/250 ml

### Implementation

- Do not use theophylline with this product; may cause toxicity

**PO route**

- Give once a day for 5-10 days depending on condition
- Give without regard to food
- Store at room temperature

**IV route**

- Discontinue primary **IV** while administering moxifloxacin, give over 60 min
- Do not give SUBCUT, IM
- Available as premixed sol, may be diluted at ratios from 1:10 to 10:1, do not refrigerate, give by direct infusion or through Y-type infusion set, do not add other medications to sol or infuse through same IV line at same time
- Do not refrigerate
- Flush line with compatible sol before and after use
- Do not admix

**Solution compatibilities:** 0.9% NaCl, $D_5$, $D_{10}$, LR, sterile water for inj

## ADVERSE EFFECTS

**CNS:** Headache, dizziness, fatigue, insomnia, depression, restlessness, seizures, confusion, increased intracranial pressure, peripheral neuropathy, pseudotumor cerebri, fever

**CV:** Prolonged QT interval, dysrhythmias, torsades de pointes, tachycardia

**EENT:** Blurred vision, tinnitus, taste changes

**GI:** Nausea, increased ALT, AST, flatulence, heartburn, vomiting, diarrhea, oral candidiasis, dysphagia, pseudomembranous colitis, abdominal pain, dyspepsia, constipation, gastroenteritis, xerostomia

**GU:** Renal failure

**INTEG:** Rash, pruritus, urticaria, photosensitivity, flushing, fever, chills, injection site reactions

**MISC:** Candidiasis vaginitis

**MS:** Tremor, arthralgia, tendon rupture, myalgia

**SYST:** Anaphylaxis, Stevens-Johnson syndrome, angioedema, toxic epidermal necrolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (75%) (PO) |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | Increased in renal disease |

### Pharmacodynamics

| | PO |
|---|---|
| **Onset** | Rapid |
| **Peak** | 1 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Aluminum hydroxide, calcium, didanosine, iron, sucralfate, zinc sulfate: decreased absorption of moxifloxacin

CycloSPORINE: increased cycloSPORINE effect

Haloperidol, chloroquine, droperidol, pentamidine; arsenic trioxide, levomethadyl: increased QT prolongation

Probenecid: increased blood levels

Warfarin: increased warfarin effect

### Drug classifications

Antacids (magnesium), iron salts: decreased absorption of moxifloxacin

Class IA/III antidysrhythmics, some phenothiazines, β-agonists, local anesthetics, tricyclics, CYP3A4 inhibitors (amiodarone, clarithromycin, erythromycin, telithromycin, troleandomycin), CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone): increased QT prolongation

NSAIDs: increased seizure risk

**BLACK BOX WARNING:** Corticosteroids: increased tendon rupture

### Drug/food

Enteral feeding: decreased absorption of moxifloxacin

### Drug/lab test

Increased: glucose, amylase, lipids, triglycerides, uric acid, LDH

Decreased: potassium

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for previous sensitivity reaction
- Assess patient for signs and symptoms of infection including characteristics of wounds, sputum, urine, stool, WBC $>10{,}000/mm^3$, fever baseline, during treatment
- Obtain C&S before beginning product therapy to identify if correct treatment has been initiated
- **Assess for allergic reactions, Stevens-Johnson syndrome, toxic epidermal necrolysis, and anaphylaxis:** rash, urticaria, pruritus, chills, fever, joint pain; may occur a few days after therapy begins; EPINEPHrine and resuscitation equipment should be available for anaphylactic reaction
- Assess for CNS symptoms: headache, dizziness, fatigue, insomnia, depression, **seizures**
- Identify urine output; if decreasing, notify prescriber (may indicate nephrotoxicity); also check for increased BUN, creatinine, electrolytes
- Monitor blood tests: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test monthly if patient is on long-term therapy
- Monitor electrolytes: potassium, sodium chloride monthly if patient is on long-term therapy
- **Pseudomembranous colitis:** assess for diarrhea, abdominal pain, fever, fatigue, anorexia; possible anemia, elevated WBC and low serum albumin; stop product and usually give either vancomycin or IV metroNIDAZOLE
- Monitor for bleeding: ecchymosis, bleeding gums, hematuria, stool guaiac daily if on long-term therapy
- Assess for overgrowth of infection: perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum

**BLACK BOX WARNING:** Assess for tendon pain, rupture, tendinitis; if tendon becomes inflamed, drug should be discontinued, more common in achilles tendon

- **QT prolongation:** Monitor ECG for QT prolongation, ejection fraction; assess for chest pain, palpitations, dyspnea
- **Pregnancy/breastfeeding:** Only use if benefits outweigh fetal risk

### Patient/family education

**BLACK BOX WARNING:** Notify prescriber of tendon pain, inflammation, stop drug

- Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
- Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate superinfection; report itching, rash, pruritus, urticaria
- Instruct patient to take all medication prescribed for the length of time ordered; not to give medication to others
- Advise patient to notify prescriber of diarrhea with blood or pus
- Advise patient to rinse mouth frequently, use sugarless candy or gum for dry mouth
- Advise patient to take as prescribed, not to double or miss doses

### Evaluation

**Positive therapeutic outcome**

- Absence of signs/symptoms of infection (WBC $<10{,}000/mm^3$, temp WNL)
- Reported improvement in symptoms of infection

## moxifloxacin ophthalmic

*See Appendix B*

## mupirocin topical

*See Appendix B*

## mycophenolate (Rx)

(mie-koe-feen'oh-late)

**Mycophenolate Mofetil CellCept, Myfortic (Rx)**

*Func. class.:* Immunosuppressant

**ACTION:** Inhibits inflammatory responses that are mediated by the immune system; prolongs survival of allogenic transplants

**Therapeutic outcome:** Absence of graft rejection

**USES:** Organ transplants to prevent rejection (renal); prophylaxis of rejection in allogenic cardiac, hepatic, renal transplants

**Unlabeled uses:** Refractory uveitis, 2nd-line therapy for Churg-Strauss syndrome, diffuse proliferative lupus nephritis (in combination), rheumatoid arthritis, psoriasis

## CONTRAINDICATIONS

Hypersensitivity to this product or mycophenolic acid

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Breastfeeding, lymphomas, neutropenia, renal disease, accidental exposure, anemia

**BLACK BOX WARNING:** Infection, neoplastic disease, requires a specialized care setting, requires an experienced clinician

## DOSAGE AND ROUTES

### Renal transplant (to prevent organ rejection)

**Adult:** PO mycophenolate mofetil 1 g or 720 mg mycophenolate sodium mg bid given to renal transplant patients in combination with corticosteroids and cycloSPORINE

**Child:** SUSP 600 mg bid or PO cap 750 mg bid body surface area (BSA) of 1.25 to 1.5 $m^2$ or 1 g bid BSA >1.5 $m^2$

### Renal dose

**Adult:** PO/IV GFR <25 ml/min, max 2 g/day

### Cardiac transplant (to prevent organ rejection)

**Adult:** PO/**IV** 1.5 g bid, **IV** can be started ≤24 hr after transplant, switch to PO when able

### Hepatic transplant (to prevent organ rejection)

**Adult:** PO 1.5 g bid, **IV** 1 g over ≥2 hr

**Available forms:** Caps 250 mg; tabs 500 mg; inj (powder) 500 mg/20 ml vial; powder for oral susp 200 mg/ml; ext rel tab (Myfortic) 180, 360 mg

### Implementation

- May be given in combination with corticosteroids and cycloSPORINE

**PO route**

- Do not crush, chew tabs; do not open caps; avoid inhalation or direct contact with skin, mucous membranes; teratogenic in animals
- Give alone for better absorption
- Delayed rel tabs and caps; oral **susp** and tab are not interchangeable

**Intermittent IV infusion route**

- Reconstitute each vial with 14 ml $D_5W$, shake gently, further dilute to 6 mg/ml, dilute 1-g doses in 140 ml $D_5W$, and 1.5-g doses in 210 ml $D_5W$, give by slow **IV** infusion ≥2 hr, never give by bolus or rapid **IV** injection
- Do not give with other medications or solutions

**Y-site compatibilities:** Alemtuzumab, alfentanil, amikacin, anidulafungin, argatroban, bivalirudin, caspofungin, cefepime, DAPTOmycin, DOPamine, norepinephrine, octreotide, oxytocin, tacrolimus, tigecycline, tirofiban, vancomycin, zoledronic acid

**Y-site incompatibilities:** Acyclovir, allopurinol, amifostine, aminocaproic acid, aminophylline, amphotericin B, colloidal/lipid complex/liposome, ampicillin, atenolol, azithromycin, aztreonam

## ADVERSE EFFECTS

**CNS:** *Tremor, dizziness, insomnia, headache, fever,* progressive multifocal leukoencephalopathy, asthenia, paresthesia, anxiety, pain

**CV:** *Hypertension, chest pain,* hypotension, edema

**GI:** *Nausea, vomiting,* stomatitis, *diarrhea, constipation,* GI bleeding, abdominal pain, anorexia, dyspepsia

**GU:** *UTI, hematuria,* renal tubular necrosis, polyomavirus-associated nephropathy

**HEMA:** Leukopenia, thrombocytopenia, anemia, pancytopenia, pure red cell aplasia, neutropenia

**INTEG:** *Rash*

**META:** *Peripheral edema, hypercholesterolemia, hypophosphatemia, edema, hypo/hyperkalemia, hyperglycemia,* hypocalcemia, hypomagnesemia

**MS:** Arthralgia, muscle wasting, back pain, weakness

**RESP:** *Dyspnea, respiratory infection, increased cough, pharyngitis, bronchitis, pneumonia,* pleural effusion, pulmonary fibrosis

**SYST:** Lymphoma, nonmelanoma skin carcinoma, sepsis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid and complete |
| **Distribution** | Unknown |
| **Metabolism** | To active metabolite (MPA) |
| **Excretion** | Urine, feces |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Acyclovir, ganciclovir, valacyclovir: increased toxicity
AzaTHIOprine: increased bone marrow suppression
Cholestyramine, cycloSPORINE, rifamycin: decreased levels of mycophenolate
Phenytoin: increased effects; decreased protein binding of phenytoin
Probenecid: increased levels of mycophenolate
Theophylline: increased effects; decreased protein binding of theophylline

### Drug classifications

Antacids (magnesium, aluminum): decreased levels of mycophenolate
Anticoagulants, NSAIDs, thrombolytics, salicylates: increased risk of bleeding
Contraceptives (oral), live attenuated vaccines: decreased effects
Immunosuppressives, salicylates: increased levels of mycophenolate

### Drug/herb

Astragalus, echinacea, melatonin: interferes with immunosuppression

### Drug/food

Decreased absorption if taken with food

### Drug/lab test

Increased: serum creatinine, BUN, potassium, cholesterol, glucose, abnormal LFTs
Decreased: WBC, platelets, neutrophils

## NURSING CONSIDERATIONS

### Assessment

- **Progressive multifocal leukoencephalopathy; may be fatal:** ataxia, confusion, apathy, hemiparesis, visual problems, weakness; side effects should be reported to the FDA

**BLACK BOX WARNING: Infection/lymphoma:** may occur from immunosuppressives, increased infections including BK virus, and may cause kidney graft loss

- Monitor blood tests: CBC monthly during treatment
- Monitor liver function tests: alkaline phosphatase, AST, ALT, bilirubin
- Monitor renal studies: BUN, CCr, electrolytes
- **Pregnancy:** obtain pregnancy test within 1 wk prior to initiation of treatment; confirm negative pregnancy test, do not use in pregnancy

### Patient/family education

- Advise patient that repeated lab tests are necessary
- Instruct patient to notify prescriber if pregnancy is planned or suspected (D), to use two forms of contraception before, during, and 6 wk after therapy

**BLACK BOX WARNING:** Advise patient that infection and lymphomas may occur

- Teach patient to take on empty stomach, not to crush, chew, break ext rel caps

**BLACK BOX WARNING:** Infection: Teach patient to report fever, chills, sore throat, fatigue, serious infection may occur, avoid crowds, persons with known infections

**BLACK BOX WARNING: Neoplastic disease:** Teach patient lymphoma and other neoplastic diseases may occur, particularly skin cancer, limit UV exposure by wearing protective clothing, sunscreen

### Evaluation

#### Positive therapeutic outcome

- Absence of graft rejection

mafenide topical
magnesium chloride (Rx)
magnesium hydroxide (OTC)
mannitol (Rx)
megestrol (Rx)
meperidine (Rx)
metFORMIN (Rx)
methotrexate (Rx)
methylnaltrexone (Rx)
metipranolol ophthalmic
metoprolol (Rx)
micafungin (Rx)
miconazole topical
milrinone (Rx)
minoxidil (Rx, OTC)
misoprostol (Rx)
modafinil (Rx)
moxifloxacin (Rx)
mycophenolate (Rx)
magaldrate (OTC)
magnesium citrate (OTC)
magnesium oxide (OTC)
meclizine (OTC, Rx)
melphalan (Rx)
meropenem (Rx)
methadone (Rx)
methyldopa/methyldopate (Rx)
methylphenidate (Rx)
metoclopramide (Rx)
metroNIDAZOLE (Rx)
miconazole (Rx, OTC)
miconazole vaginal antifungal
miltefosine
mirabegron
mitoMYcin (Rx)
montelukast (Rx)
moxifloxacin ophthalmic
magnesium salts
magnesium gluconate (OTC)
magnesium sulfate (OTC, Rx)
medroxyPROGESTERone (Rx)
memantine (Rx)
mesalamine, 5-ASA (Rx)
methimazole (Rx)
methylergonovine (Rx)
methylPREDNISolone (Rx)
metolazone (Rx)
metroNIDAZOLE topical
miconazole nitrate
midazolam (Rx)
minocycline (Rx)
mirtazapine (Rx)
mitoXANtrone (Rx)
morphine (Rx)
mupirocin topical

## nadolol (Rx)

(nay-doe'lole)

**Corgard, Syn-Nadol**

*Func. class.:* Antihypertensive, antianginal

*Chem. class.:* β-Adrenergic receptor blocker

**Do not confuse:** Corgard/Cognex/Coreg

**ACTION:** Long-acting, nonselective β-adrenergic receptor blocking agent, blocks $\beta_1$ in the heart and $\beta_2$ in the lungs, uterus, and circulatory system; mechanism is similar to that of propranolol

**Therapeutic outcome:** Decreased B/P, heart rate

**USES:** Chronic stable angina pectoris, mild to moderate hypertension, atrial fibrillation

**Unlabeled uses:** Tachydysrhythmias, anxiety, tremors, esophageal varices (rebleeding only)

## CONTRAINDICATIONS

Hypersensitivity to this product, cardiac failure, cardiogenic shock, 2nd- or 3rd-degree heart block, bronchospastic disease, sinus bradycardia, HF, COPD, asthma

**Precautions:** Pregnancy, breastfeeding, diabetes mellitus, renal disease, hyperthyroidism, peripheral vascular disease, myasthenia gravis, major surgery, nonallergic bronchospasm

**BLACK BOX WARNING:** Abrupt discontinuation

## DOSAGE AND ROUTES

### Angina pectoris/hypertension

**Adult:** PO 40 mg/day; increase by 40-80 mg q2-14 days; maintenance 40-240 mg/day for angina, 40-320 mg/day for hypertension

**Geriatric:** PO 20 mg/day, may increase by 20 mg until desired dose

### Renal dose

**Adult:** PO CCr 31-50 ml/min give q24-36hr; CCr 10-30 ml/min give q24-48hr; CCr <10 ml/min give q40-60hr

### Esophageal varices (unlabeled)

**Adult:** PO 40 mg qday

**Available forms:** Tabs 20, 40, 80, 160 mg

### Implementation

- Give at bedtime; tab may be crushed or swallowed whole; give with food to prevent GI upset; give reduced dosage in renal dysfunction; check apical pulse prior to use, if <50 bpm, withhold dose and notify prescriber
- Store protected from light, moisture; place in cool environment
- Check apical pulse before each dose hold if <60 bpm, notify prescriber
- Give without regard to food
- Discontinue other antihypertensives gradually

**BLACK BOX WARNING:** Taper over 1-2 wk to discontinue, do not stop abruptly

## ADVERSE EFFECTS

**CNS:** Depression, *dizziness,* fatigue, lethargy, paresthesia, headache, *weakness,* insomnia, memory loss, nightmares

**CV:** *Bradycardia, hypotension,* HF, palpitations, AV block, chest pain, peripheral ischemia, flushing, edema, vasodilatation, conduction disturbances

**EENT:** Blurred vision, dry eyes, nasal congestion

**ENDO:** Hyperglycemia, hypoglycemia

**GI:** Nausea, vomiting, diarrhea, colitis, constipation, cramps, dry mouth, flatulence, hepatomegaly, pancreatitis, taste distortion

**GU:** *Impotence,* decreased libido

**HEMA:** Agranulocytosis, thrombocytopenia

**INTEG:** Rash, pruritus, fever, alopecia

**RESP:** Dyspnea, respiratory dysfunction, bronchospasm, cough, wheezing, pharyngitis, laryngospasm, pulmonary edema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Variably absorbed |
| **Distribution** | Crosses placenta; minimal concentration in CNS, protein binding 30% |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys, unchanged |
| **Half-life** | 10-24 hr; increased in renal disease |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Variable |
| **Peak** | 3-4 hr |
| **Duration** | 10-24 hr |

## INTERACTIONS

### Individual drugs

CloNIDine, EPINEPHrine: increased hypotension, bradycardia, monitor for bradycardia

Digoxin: increased bradycardia

Thyroid: decreased β-blocking effect

### Drug classifications

Antidiabetics, insulins: Increase: lack of dose stability

Antihypertensives: increased hypotension

Ergots: peripheral ischemia

MAOIs: increased orthostatic hypotension, monitor B/P

NSAIDs: decreased antihypertensive effect
Phenothiazines, general anesthetics: increased hypotensive effects

### Drug/herb
Dong quai, garlic, ginseng, yohimbe: increased hypertension, avoid concurrent use

### Drug/lab test
Increased: serum potassium, serum uric acid, ALT, AST, alkaline phosphatase, LDH, blood glucose, cholesterol, ANA, triglycerides

## NURSING CONSIDERATIONS
### Assessment
- **Hypertension:** check that prescriptions have been filled
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, discontinue product or breastfeeding, excreted in breast milk
- **Angina:** monitor frequency of angina, alleviating factors
- Monitor B/P at beginning of treatment, periodically thereafter; note rate, rhythm, quality of apical/radial pulse before administration; notify prescriber of any significant changes (pulse <60 bpm), orthostatic hypotension, if severe hypotension occurs, may use vasopressors to raise B/P
- Check for baselines in renal, liver function tests before therapy begins
- Assess for edema in feet, legs daily; monitor I&O, daily weight; check for jugular vein distention and crackles bilaterally, dyspnea (HF)
- Headache, light-headedness, decreased B/P; may indicate a need for decreased dosage

**BLACK BOX WARNING: Abrupt discontinuation:** can result in MI, myocardial ischemia, ventricular dysrhythmias, severe hypertension, withdraw slowly by tapering over 1-2 wk, if symptoms return, restart

### Patient/family education
- Teach patient not to discontinue product abruptly; taper over 1-2 wk; may cause precipitate angina, serious dysrhythmias if stopped abruptly
- Teach patient not to use OTC products containing α-adrenergic stimulants (such as nasal decongestants, cold preparations); to avoid alcohol and smoking and to limit sodium intake as prescribed, to take as prescribed at same time each day; do not double; take missed dose as soon as remembered if before 8 hr prior to next dose
- Teach patient how to take pulse and B/P at home; to hold dose if pulse is ≤50 bpm, systolic B/P <90 mm Hg; advise when to notify prescriber; to take missed dose as soon as possible if less than 8 hr
- **Hypertension:** instruct patient to comply with weight control, dietary adjustments, modified exercise program; to report weight gain >5 lb, swelling, unusual bruising, bleeding
- Advise patient to carry/wear emergency ID to identify product being taken, allergies; teach patient product controls symptoms but does not cure condition
- Caution patient to avoid hazardous activities if dizziness, drowsiness are present; to rise slowly to prevent orthostatic hypotension
- **Teach patient to report symptoms of HF:** difficult breathing, especially on exertion or when lying down, night cough, swelling of extremities or bradycardia, dizziness, confusion, depression, fever
- Teach patient to take product as prescribed, not to double doses, skip doses; take any missed doses as soon as remembered if at least 4 hr until next dose

### Evaluation
**Positive therapeutic outcome**
- Decreased B/P in hypertension



## nafcillin (Rx)
(naf-sill'in)
**Nallpen, Unipen** 🍁
*Func. class.:* Antiinfective, broad-spectrum
*Chem. class.:* Penicillinase-resistant penicillin

**ACTION:** Interferes with cell wall replication of susceptible organisms; osmotically unstable cell wall swells, bursts from osmotic pressure

**Therapeutic outcome:** Bactericidal effects for gram-positive cocci *Staphylococcus aureus, Streptococcus viridans, Streptococcus pneumoniae* and infections caused by penicillinase-producing *Staphylococcus*

**USES:** Infections caused by penicillinase-producing staphylococci, streptococci; respiratory tract, skin, skin structure, urinary tract, bone, joint infections; sinusitis; endocarditis; septicemia; meningitis

## CONTRAINDICATIONS
Hypersensitivity to penicillins or corn

**Precautions:** Pregnancy, breastfeeding, neonates, GI disease, asthma, hypersensitivity to cephalosporins or carbapenems, electrolyte imbalances, hepatic/renal disease, pseudomembranous colitis

## DOSAGE AND ROUTES

**Systemic infections caused by susceptible organisms (methicillin-sensitive *S. aureus*)**

**Adult: IV** 500-1000 mg q4hr; IM 500-1000 mg q6-8hr, max 12 g/day

**Infant and child >1 mo: IV** 150-200 mg/kg/day in divided doses q4-6hr

**Neonate >7 days (weight >2 kg): IV** 25 mg/kg q6hr

**Neonate ≤7 days (weight ≤2 kg): IV** 25 mg/kg q8hr

**Available forms:** Powder for inj 1 premixed or Add-Vantage vials (1 g)

### Implementation

**IM route**

- Reconstitute vials: Add 1.7 (1.8 Nafcil), 3, 4, or 6.4 ml (6.6 ml NaCl) (sterile water for INJ, 0.9% NaCl, bacteriostatic water for INJ with benzyl alcohol or parabens) to vials with 1 g, 2g of nafcillin, respectively (250 mg/ml)
- No further dilution needed; after reconstitution, inject in deep muscle mass

**IV route**

- Reconstitute vials: add 1.7, 3, 4, or 6.4 ml sterile water for inj, 0.9% NaCl, bacteriostatic water for inj with benzyl alcohol or parabens to vials with 500 mg, 1 g, 2 g of nafcillin, respectively (250 mg/ml); pharmacy bulk pack reconstitute 10 g/93 ml sterile water inj or 0.9% NaCl (100 mg/ml)

**Direct IV INJ route**

- Further dilute the reconstituted sol in 15-30 ml of sterile water for inj, 0.45% NaCl, 0.9% NaCl; inj slowly over 5-10 min into the tubing of a free-flowing compatible IV solution

**Intermittent IV route**

- Vials, further dilute reconstituted solution to 2-40 mg/ml, for peripheral vein inf ≤20 mg/ml (preferred); piggyback unit no further dilution needed; infuse ≥30-60 min, make sure entire dose is given before 10% or more of solution is inactivated
- Extravasation management: stop infusion and disconnect; gently aspirate extravasated solution; do not flush line; use hyaluronidase; remove cannula/needle; apply dry cold compresses; elevate extremity

**Y-site compatibilities:** Acyclovir, alfentanil, amikacin, aminophylline, amphotericin B lipid complex (Abelcet), anidulafungin, argatroban, ascorbic acid injection, atenolol, atracurium, atropine, aztreonam, benztropine, bivalirudin, bleomycin, bretylium, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, carmustine, cefamandole, ceFAZolin, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chlorproMAZINE, cimetidine, CISplatin, clindamycin, cyanocobalamin, cyclophosphamide, cycloSPORINE, DACTINomycin, DAPTOmycin, DAUNOrubicin liposome, dexamethasone, digoxin, DOBUTamine, DOCEtaxel, DOPamine, DOXOrubicin liposomal, enalaprilat, ePHEDrine, EPINEPHrine, epoetin alfa, erythromycin, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, foscarnet, furosemide, gallium, ganciclovir, gatifloxacin, gemtuzumab, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, imipenem-cilastatin, indomethacin, isoproterenol, ketorolac, lactated Ringer's, lepirudin, leucovorin, lidocaine, linezolid injection, LORazepam, magnesium sulfate, mannitol, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, milrinone, morphine, multiple vitamins injection, naloxone, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel (solvent/surfactant), pamidronate, pancuronium, pantoprazole, PEMEtrexed, penicillin G potassium/sodium, PENTobarbital, perphenazine, PHENobarbital, phentolamine, phenylephrine, phytonadione, piperacillin, polymyxin B, potassium acetate/chloride, procainamide, prochlorperazine, propofol, propranolol, ranitidine, ringer's injection, sodium bicarbonate, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin clavulanate, tigecycline, tirofiban, TNA (3-in-1), tobramycin, tolazoline, TPN (2-in-1), urokinase, vasopressin, vinBLAStine, voriconazole, zidovudine, zoledronic acid

**Y-site incompatibilities:** Droperidol, fentaNYL/droperidol, labetalol, nalbuphine, pentazocine, regular insulin, verapamil

## ADVERSE EFFECTS

**CNS:** Lethargy, hallucinations, anxiety, depression, muscle twitching, coma, seizures

**GI:** *Nausea, vomiting, diarrhea,* increased AST, ALT, abdominal pain, glossitis, pseudomembranous colitis

**GU:** Oliguria, proteinuria, hematuria, vaginitis, moniliasis, glomerulonephritis, interstitial nephritis

**HEMA:** Anemia, increased bleeding time, bone marrow depression, neutropenia, agranulocytosis

**INTEG:** Tissue necrosis, extravasation injury at injection site

**SYST:** Anaphylaxis, serum sickness, Stevens-Johnson syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (IM); erratic (PO) |
| **Distribution** | Widely distributed; crosses placenta, 90% protein bound |
| **Metabolism** | Liver; 70% |
| **Excretion** | Kidneys, unchanged; breast milk |
| **Half-life** | 30-90 min; increased in renal disease |

### Pharmacodynamics

| | PO | IM | IV |
|---|---|---|---|
| **Onset** | ½ hr | ½ hr | Immediate |
| **Peak** | 1-2 hr | 1-2 hr | Infusion end |
| **Duration** | Unknown | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

CycloSPORINE: decreased effect of cycloSPORINE
Probenecid: increased nafcillin levels

### Drug classifications

Tetracyclines, aminoglycosides: avoid use

### Drug/food

Food, carbonated drinks, citrus fruit juices: decreased absorption

### Drug/lab test

False positive: urine glucose, urine protein
Decreased: potassium, Hgb/Hct, neutrophils

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for previous sensitivity reaction to penicillins or other cephalosporins; cross-sensitivity between penicillins and cephalosporins is common
- Assess patient for signs and symptoms of infection including characteristics of wounds, sputum, urine, stool, WBC $>10,000/mm^3$, earache, fever; obtain information baseline, during treatment
- Obtain C&S before beginning product therapy to identify if correct treatment has been initiated
- **Assess for allergic reactions, anaphylaxis:** rash, urticaria, pruritus, chills, fever, dyspnea, laryngeal edema, joint pain; angioedema may occur a few days after therapy begins; cross-sensitivity with cephalosporins may occur; EPINEPHrine, resuscitation equipment should be available for anaphylactic reaction
- Assess renal function tests: urinalysis, protein, blood, BUN, creatinine; abnormal urinalysis may indicate nephrotoxicity
- Identify urine output; if decreasing, notify prescriber (may indicate nephrotoxicity)
- Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test monthly if patient is on long-term therapy, electrolytes
- Monitor electrolytes: potassium, sodium, chloride monthly if patient is on long-term therapy
- **Pseudomembranous colitis:** assess for diarrhea, abdominal pain, fever, fatigue, anorexia; possible anemia, elevated WBC and low serum albumin; stop product and usually give either vancomycin or IV metroNIDAZOLE
- Monitor for bleeding: ecchymosis, bleeding gums, hematuria, stool guaiac daily if on long-term therapy
- Assess for overgrowth of infection: perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum
- **IV site:** assess for redness, swelling, pain at site
- **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding

### Patient/family education

- Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
- Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate superinfection
- Instruct patient to take all medication prescribed for the length of time ordered
- Advise patient to notify prescriber of diarrhea with blood or pus, which may indicate pseudomembranous colitis
- Advise patient to carry/wear emergency ID if allergic to penicillins
- Teach patient to avoid use with other products unless approved by prescriber

### Evaluation

#### Positive therapeutic outcome

- Absence of signs/symptoms of infection (WBC $<10,000/mm^3$, temp WNL, absence of red, draining wounds, earache)
- Reported improvement in symptoms of infection

**TREATMENT OF ANAPHYLAXIS:** Withdraw product, maintain airway, administer EPINEPHrine, aminophylline, $O_2$, **IV** corticosteroids

**⚠ HIGH ALERT**

## nalbuphine (Rx)

(nal′byoo-feen)
**Nubain**
*Func. class.:* Opioid analgesic
*Chem. class.:* Synthetic opioid agonist/antagonist

**Do not confuse:** nalbuphine/naloxone

**ACTION:** Depresses pain impulse transmission at the spinal cord level by interacting with opioid receptors

**Therapeutic outcome:** Relief of pain

**USES:** Moderate to severe pain, supplement to anesthesia

## CONTRAINDICATIONS

Hypersensitivity to this product or parabens, addiction (opioid)

**Precautions:** Pregnancy, breastfeeding, addictive personality, increased ICP, MI (acute), severe heart disease, respiratory depression, renal/hepatic disease, bowel impaction, abrupt discontinuation

## DOSAGE AND ROUTES

### Analgesic

**Adult:** SUBCUT/IM/**IV** max 10 mg q3-6hr prn, max 160 mg/day

### Balanced anesthesia adjunct

**Adult:** **IV** 0.3-3 mg/kg given over 10-15 min; may give 0.25-0.5 mg/kg as needed (maintenance)

**Available forms:** Inj 10, 20 mg/ml

### Implementation

- Give by inj (IM, **IV**), only with resuscitative equipment available; give slowly to prevent rigidity
- Store in light-resistant area at room temperature

**IM route**

- Give inj deeply in large muscle mass; rotate inj sites; protect vial from light

**Direct IV route**

- Give direct **IV** undiluted 10 mg or less over 3-5 min or more into free-flowing IV line of $D_5W$, NS, LR

**Syringe incompatibilities:** Diazepam, PENTobarbital

**Y-site incompatibilities:** Nafcillin, sargramostim

## ADVERSE EFFECTS

**CNS:** *Drowsiness, dizziness, confusion, headache, sedation, euphoria,* dysphoria (high doses), hallucinations, increased dreaming, tolerance, physical and psychological dependency
**CV:** Bradycardia, change in B/P, cardiac arrest
**EENT:** Blurred vision, miosis, diplopia
**GI:** *Nausea, vomiting, anorexia, constipation, cramps,* abdominal pain, dyspepsia, xerostomia, bitter taste
**GU:** Urinary urgency
**INTEG:** *Rash,* urticaria, flushing, *diaphoresis,* pruritus
**RESP:** Respiratory depression/arrest, pulmonary edema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (SUBCUT, IM); completely absorbed (**IV**) |
| **Distribution** | Crosses placenta |
| **Metabolism** | Liver, extensively |
| **Excretion** | Feces, kidneys, unchanged (small amounts); breast milk |
| **Half-life** | 3-6 hr |

### Pharmacodynamics

| | IM | SUBCUT | IV |
|---|---|---|---|
| **Onset** | Up to 15 min | Up to 15 min | 2-3 min |
| **Peak** | 1 hr | Unknown | ½ hr |
| **Duration** | 3-6 hr | 3-6 hr | 3-6 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased respiratory depression, hypotension, sedation

### Drug classifications

Antipsychotics, CNS depressants, sedative/hypnotics, skeletal muscle relaxants: increased respiratory depression, hypotension
Opiates: increased effects with other CNS depressants
MAOIs: increase: severe reactions, decrease dose

### Drug/herb

Increase: CNS depression, kava, valerian, hops, chamomile

## NURSING CONSIDERATIONS

### Assessment

- **Assess pain characteristics** (location, intensity, type) before medication administration, 30-60 min after treatment, titrate upward by 25%-50% until pain is reduced by 50%

• Assess bowel status; constipation is common, may need laxative or stool softener
• Monitor VS after parenteral route; note muscle rigidity, product history, liver, kidney function tests; respiratory dysfunction: respiratory depression, character, rate, rhythm; notify prescriber if respirations are <10/min
• **Monitor CNS changes:** dizziness, drowsiness, hallucinations, euphoria, LOC, pupil reaction
• Monitor allergic reactions: rash, urticaria
• Monitor withdrawal reactions in opiate-dependent individuals: PE, vascular occlusion, abscesses, ulcerations, nausea, vomiting, seizures; low potential for dependence
• **Respiratory dysfunction:** Monitor respiratory depression, character; rate, rhythm; notify prescriber if respirations <10/min
• **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding

### Patient/family education

• Instruct patient to report any symptoms of CNS changes, allergic reactions
• Teach patient that physical dependency can result from long-term use, although there is a low potential for dependency, profuse sweating, twitching; without treatment, symptoms resolve in 5-14 days; chronic abstinence syndrome may last 2-6 mo
• Caution patients to avoid CNS depressants: alcohol, sedative/hypnotics for at least 24 hr after taking this product
• Discuss with patient that dizziness, drowsiness, confusion are common; to avoid getting up without assistance
• Discuss in detail all aspects of the product: reason for taking product and expected results
• Instruct patient to change position slowly to prevent orthostatic hypotension
• Teach patient that withdrawal symptoms may occur: nausea, vomiting, cramps, fever, faintness, anorexia, profuse sweating, twitching; without treatment symptoms resolve in 5-14 days, chronic abstinence syndrome may last 2-6 mo

### Evaluation

**Positive therapeutic outcome**
• Relief of pain without respiratory depression

## TREATMENT OF OVERDOSE:

Naloxone (Narcan) 0.2-0.8 **IV,** $O_2$, **IV** fluids, vasopressors

## naloxone (Rx)

(nal-oks′one)
**Evzio, Narcan**
*Func. class.:* Opioid antagonist, antidote
*Chem. class.:* Thebaine derivative

**Do not confuse:** naloxone/naltrexone nalbuphine Narcan/Norcuron

**ACTION:** Competes with opioids at opioid-receptor sites

**Therapeutic outcome:** Absence of opioid overdose

**USES:** Respiratory depression induced by opioids; refractory circulatory shock, asphyxia neonatorum, coma, hypotension, opiate agonist overdose

**Unlabeled uses:** IBS, opiate agonist dependence, opiate agonist-induced constipation, pruritus

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, neonates, children, CV disease, opioid dependency, seizure disorder, drug dependency, hepatic disease

## DOSAGE AND ROUTES

### Opioid-induced respiratory depression (known or suspected opiate agonist overdose)

**Adult: IV**/SUBCUT/IM 0.4-2 mg; repeat q2-3min if needed, max 10 mg; **IV** infusion loading dose 0.005 mg/kg, then 0.0025 mg/kg/hr; nasal spray 1 spray, may repeat q2-3min in alternate nostril if needed
**Child <5 yr or ≤20 kg: IV**/intraosseous 0.01 mg/kg slowly followed by 0.1 mg/kg if needed; **IV** infusion (PALS) 0.04-0.16 mg/kg/hr, titrate; nasal spray 1 spray, may repeat q2-3min in alternate nostril if needed

### Postoperative opioid-induced respiratory depression

**Adult: IV** 0.1-0.2 mg q2-3min prn
**Child: IV** 0.005-0.01 mg/kg q2-3min prn

### Nausea/vomiting from continuous morphine infusion/urinary retention (unlabeled)

**Adult: IV** 0.2 mg

**Available forms:** Inj 0.4, 1 mg/ml; nasal spray 4 mg/0.1 ml

### Implementation

• Store at room temperature and protect from light
• Double-check dose; those taking opioids (>1 wk) are sensitive to this product

**Direct IV route**
- Give undiluted (suspected opioid overdose); give 0.4 mg or less over 15 sec or titrate inf to response

**Continuous IV infusion route**
- Dilute 2 mg/500 ml 0.9% NaCl or $D_5W$ (4 mcg/ml), titrate to response
- Give only with resuscitative equipment, $O_2$ nearby
- Use only sol prepared within 24 hr

**Y-site compatibilities:** Acyclovir, alfentanil, amikacin, aminocaproic acid, aminophylline, anidulafungin, ascorbic acid, atenolol, atracurium, atropine, azaTHIOprine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, cefamandole, ceFAZolin, cefmetazole, cefonicid, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, cephalothin, cephapirin, chloramphenicol, chlorproMAZINE, cimetidine, CISplatin, clindamycin, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doxacurium, DOXOrubicin, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, epoetin alfa, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, folic acid, furosemide, ganciclovir, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, inamrinone, indomethacin, insulin (regular), irinotecan, isoproterenol, ketorolac, labetalol, levofloxacin, lidocaine, linezolid, LORazepam, mannitol, mechlorethamine, meperidine, metaraminol, methicillin, methotrexate, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, mezlocillin, miconazole, midazolam, milrinone, minocycline, mitoXANtrone, morphine, multiple vitamins, mycophenolate, nafcillin, nalbuphine, nesiritide, netilmicin, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, papaverine, PEMEtrexed, penicillin G potassium/sodium, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, phytonadione, piperacillin, piperacillin-tazobactam, polymyxin B, potassium chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, pyridoxine, quiNIDine, quinupristin-dalfopristin, ranitidine, rocuronium, sodium acetate/bicarbonate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, voriconazole, zoledronic acid

## ADVERSE EFFECTS

**CNS:** Nervousness, seizures, tremor, opioid withdrawal symptoms
**CV:** Rapid pulse, ventricular tachycardia, fibrillation, increased systolic B/P (high doses), hypo/hypertension, cardiac arrest, sinus tachycardia
**GI:** Nausea, vomiting
**RESP:** Pulmonary edema, dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (SUBCUT, IM); completely absorbed (**IV**) |
| **Distribution** | Rapidly distributed; crosses placenta |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | 1 hr; up to 3 hr (neonates) |

### Pharmacodynamics

| | IV | IM/SUBCUT |
|---|---|---|
| **Onset** | 1 min | 2-5 min |
| **Peak** | Unknown | Unknown |
| **Duration** | 45 min | 30-81 min |

## INTERACTIONS

### Individual drugs

TraMADol: increased seizures, overdose

### Drug classifications

Analgesics (opioids): decreased effects of opioid analgesics

### Drug/lab test

Interference: urine VMA, 5-HIAA, urine glucose

## NURSING CONSIDERATIONS

### Assessment

- **Assess for signs of opioid withdrawal** in drug-dependent individuals: cramping, hypertension, anxiety, vomiting; may occur up to 2 hr after administration, severity depends on length of time opioids were taken, naloxone dose
- **Assess for pain:** duration, intensity, location before, after administration; may be used for respiratory depression analgesia will be decreased

• **Assess for respiratory dysfunction:** respiratory depression, character, rate, rhythm; if respirations are <10/min, probably due to opioid overdose, administer naloxone; monitor LOC, ECG, B/P
• **Acute opioid reversal:** Patients may become very agitated and violent after use
• **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding

### Patient/family education
• Explain reason for and expected results of medication when patient is alert

### Evaluation
**Positive therapeutic outcome**
• Reversal of respiratory depression
• LOC: alert

## naphazoline ophthalmic
*See Appendix B*

## naproxen
(na-prox′en)
**Aleve, Anaprox, Anaprox DS, Apo-Napro-Na, Midol Extended Relief, Nu-Naprox, TH Naproxen**
*Func. class.:* Nonsteroidal antiinflammatory, nonopioid analgesic
*Chem. class.:* Propionic acid derivative

**ACTION:** Completely inhibits COX-1, COX-2 by blocking arachidonate; analgesic, antiinflammatory, antipyretic

**Therapeutic outcome:** Decreased pain, inflammation

**USES:** Mild to moderate pain, osteoarthritis, rheumatoid arthritis, gouty arthritis, primary dysmenorrhea, tendinitis, ankylosing spondylitis, bursitis, myalgia, dental pain, juvenile rheumatoid arthritis

## CONTRAINDICATIONS
Pregnancy, hypersensitivity to NSAIDs, salicylates, perioperative pain in CABG surgery/MI/stroke

**Precautions:** Pregnancy (1st trimester), breastfeeding, children <2 yr, geriatric, bleeding disorders, GI/cardiac disorders, hypersensitivity to other antiinflammatory agents, CCr <30 ml/min, asthma, renal failure, hepatic disease

**BLACK BOX WARNING:** GI bleeding, stroke

## DOSAGE AND ROUTES
200 mg base = 220 mg naproxen sodium

### Antiinflammatory/analgesic/antidysmenorrheal
**Adult:** PO 250-500 mg bid, max 1250 mg/day; DEL REL TAB 375-500 mg bid
**Child ≥2 yr:** PO 7 mg/kg/12 hr

### Antigout
**Adult:** PO 750 mg, then 250 mg q8hr

### OTC use
**Adult:** PO 220 mg q8-12hr or 440 mg, then 220 mg q12hr, max 660 mg/24 hr, taken no longer than 10 days
**Geriatric >65 yr:** PO max 220 mg q12hr

**Available forms: Naproxen:** tabs: 250, 375, 500 mg; del rel tabs (EC-Naprosyn, Naprosyn-E) 250, 375, 500 mg; oral susp 125 mg/5 ml; ext rel tabs (CR) 375, 500, 750 mg; **naproxen sodium;** tabs 220, 275, 550 mg; ext rel tab 220 mg

### Implementation
• Store at room temp
• Administer to patient crushed or whole **(regular release)**; do not crush, break, or chew **extended rel tab**
• Give OTC for 10 days or less unless approved by prescriber
• Adequately hydrate those taking angiotensin receptor blockers/angiotensin-converting enzyme inhibitors
• Give with food or milk to decrease gastric symptoms; give ½ hr before or 2 hr after meals for better absorption
• Patient should take with 8 oz of water and sit upright for 30 min after dose to prevent ulceration

## ADVERSE EFFECTS
**CNS:** Dizziness, drowsiness, fatigue, tremors, confusion, insomnia, anxiety, depression
**CV:** Tachycardia, peripheral edema, palpitations, dysrhythmias, MI, stroke
**EENT:** Tinnitus, hearing loss, blurred vision
**GI:** Nausea, anorexia, vomiting, diarrhea, jaundice, hepatitis, constipation, flatulence, cramps, peptic ulcer, GI ulceration, bleeding, perforation
**GU:** Nephrotoxicity: dysuria, hematuria, oliguria, azotemia
**HEMA:** Blood dyscrasias
**INTEG:** Purpura, rash, pruritus, sweating
**SYST:** Anaphylaxis, Stevens-Johnson syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Completely absorbed |
| **Distribution** | Crosses placenta, 99% protein binding |
| **Metabolism** | Liver, extensively |
| **Excretion** | Breast milk |
| **Half-life** | 10-20 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 1 hr |
| **Peak** | 2-4 hr |
| **Duration** | <7 hr |

## INTERACTIONS

### Individual drugs

Adefovir, cidofovir: increased nephrotoxicity, avoid concurrent use

Alcohol, aspirin: increased risk of GI side effects

Clopidogrel, eptifibatide, plicamycin, ticlopidine, tirofiban: increased bleeding risk

Lithium, methotrexate, probenecid, radiation: increased toxicity

Cholestyramine, sucralfate: decreased/delayed absorption of naproxen

### Drug classifications

ACE inhibitors: possible renal impairment

Antacids: decreased/delayed absorption of naproxen

Anticoagulants, SSRIs, SNRIs, thrombolytics, tricyclics: increased risk of bleeding

Antihypertensives: decreased effect of antihypertensives

Antineoplastics: increased risk of hematologic toxicity

Corticosteroids, NSAIDs: increased risk of GI adverse reactions

Diuretics: decreased effectiveness of diuretics

### Drug/herb

Fenugreek, feverfew, garlic, ginger, ginkgo, ginseng *(Panax)*, licorice: increased bleeding risk

### Drug/lab test

Increased: BUN, alkaline phosphatase, LFTs, potassium, glucose, cholesterol

Decreased: potassium, sodium

False: increased 5-HIAA, 17KS

## NURSING CONSIDERATIONS

### Assessment

- **Cardiac status:** CV thrombotic events, MI, stroke; may be fatal; not to be used in CABG

**BLACK BOX WARNING: GI status:** ulceration, bleeding, perforation; may be fatal

- Monitor liver function, renal function, other blood tests: AST, ALT, bilirubin, creatinine, BUN, CBC, Hct, Hgb, pro-time, LDH, blood glucose, WBC, platelets; if patient is on long-term therapy
- Check I&O ratio; decreasing output may indicate renal failure (long-term therapy)
- **Assess hepatotoxicity:** dark urine, clay-colored stools, yellowing of the skin and sclera, itching, abdominal pain, fever, diarrhea if patient is on long-term therapy
- Assess for allergic reactions: rash, urticaria; if these occur, product may have to be discontinued
- **Assess for ototoxicity:** tinnitus, ringing, roaring in ears; audiometric testing needed before, after long-term therapy
- Assess for vision changes: blurring, halos if taking long term; may indicate corneal, retinal damage
- Check for edema in feet, ankles, legs
- Identify prior product history; there are many product interactions
- **Monitor pain:** location, frequency, duration, characteristics, type, intensity before dose and 1 hour after
- **Arthritis:** Assess ROM, pain, swelling before and 1-2 hr after use
- **Fever:** Assess before use and 1 hr after use
- Assess for asthma, aspirin hypersensitivity, or nasal polyps, increased risk of hypersensitivity
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, avoid in >30 wk gestation, cautious use in breastfeeding
- **Beers:** Avoid chronic use in older adults unless other alternatives are not available, increased GI, bleeding risk, peptic ulcer disease

### Patient/family education

- Teach patient to report any symptoms of renal/hepatic toxicity, vision changes, ototoxicity, allergic reactions, bleeding (long-term therapy); to report use to all health care providers, **signs of MI, stroke**
- Caution patient not to exceed recommended dosage; acute poisoning may result; to take as prescribed, do not double dose

**BLACK BOX WARNING:** Teach patient to read label on other OTC products; many contain other antiinflammatories; caution patient to avoid alcohol ingestion; GI bleeding may occur

- Inform patient that the therapeutic response takes 2 wk (arthritis)
- Teach patient to report tinnitus, confusion, diarrhea, sweating, hyperventilation, blurred vision, fever, joint aches, black stools, flulike symptoms

• Teach patient to notify prescriber if pregnancy is planned or suspected, pregnancy (C), avoid breastfeeding

### Evaluation

**Positive therapeutic outcome**
- Decreased pain
- Decreased inflammation
- Increased mobility

## naratriptan (Rx)

(nair'ah-trip-tan)
**Amerge**
*Func. class.:* Antimigraine agent
*Chem. class.:* 5-$HT_1$-like receptor agonist

**Do not confuse:** Amerge/Altace/Amaryl

**ACTION:** Binds selectively to the vascular 5-$HT_1$ receptor subtype, exerts antimigraine effect; causes vasoconstriction in cranial arteries

**Therapeutic outcome:** Decreased intensity and incidence of migraines

**USES:** Acute treatment of migraine with or without aura

## CONTRAINDICATIONS

Angina pectoris, history of MI, documented silent ischemia, ischemic heart disease, concurrent ergotamine-containing preparations, uncontrolled hypertension, hypersensitivity, severe renal disease (CCr <15 ml/min), severe hepatic disease (Child-Pugh grade C), CV syndromes, hemiplegic or basilar migraines

**Precautions:** Pregnancy, breastfeeding, children, geriatric, postmenopausal women, men >40 yr, risk factors for CAD, hypercholesterolemia, obesity, diabetes, impaired renal/hepatic function, peripheral vascular disease

## DOSAGE AND ROUTES

**Adult:** PO 1 or 2.5 mg with fluids; if headache returns, repeat once after 4 hr, max 5 mg/24 hr

### Renal/hepatic dose

**Adult:** PO CCr 15-39 ml/min Max 2.5 mg/24 hr

**Available forms:** Tabs 1, 2.5 mg

### Implementation

- Do not use product if another 5-$HT_1$ agonist or an ergot preparation has been used in past 24 hr
- Give with fluids as soon as symptoms appear; may take another dose after 4 hr; max 5 mg in any 24-hr period
- Provide a quiet, calm environment with decreased stimulation, including noise, bright light, excessive talking

## ADVERSE EFFECTS

**CNS:** Dizziness, sedation, fatigue
**CV:** Increased B/P, palpitations, tachydysrhythmias, PR and $QT_C$ prolongation, ST/T wave changes, PVCs, atrial flutter, fibrillation, coronary vasospasm
**EENT:** EENT infections, photophobia
**GI:** *Nausea, vomiting*
**MISC:** Temp change sensations, tightness, pressure sensations
**MS:** *Weakness, neck stiffness,* myalgia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 28%-31% protein binding |
| **Metabolism** | Liver (metabolite) |
| **Excretion** | Urine/feces |
| **Half-life** | 6 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-3 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Sibutramine: increased serotonin syndrome risk

### Drug classifications

5-$HT_1$ agonists, ergot derivatives: increased vasospastic effect
MAOIs: increased risk of adverse reactions, do not use together
SSRIs (FLUoxetine, fluvoxaMINE, PARoxetine, sertraline), SNRIs, serotonin receptor agonists, sibutramine: increased serotonin syndrome, neuroleptic malignant syndrome

### Drug/herb

SAMe, St. John's wort: increased serotonin syndrome

## NURSING CONSIDERATIONS

### Assessment

- **Serotonin syndrome, neuroleptic malignant syndrome:** assess for increased heart rate, shivering, sweating, dilated pupils, tremors, high B/P, hyperthermia, headache, confusion; if these occur, stop product, administer a serotonin antagonist if needed; at least 2 wk should elapse between discontinuing serotoninergic agents and starting this product
- **Migraines:** assess for aura, duration, effect of lifestyle, aggravating/alleviating factors
- Cardiac status: ECG, increased B/P, dysrhythmias, monitor for PR, QT prolongation, ST-T wave changes, PVCs in those with cardiac disease

• Assess for stress level, activity, recreation, coping mechanisms
• Assess neurologic status: LOC, blurred vision, nausea, tics preceding headache
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, has been shown to increase birth defects, cautious use in breastfeeding

### Patient/family education

• Teach patient to report pain, tightness in chest, neck, throat, or jaw; notify prescriber immediately if sudden, severe abdominal pain occurs
• Teach patient to use contraception while taking product, to notify prescriber if pregnancy is planned or suspected
• Teach patient not to use if another 5-$HT_1$ agonist or an ergot preparation has been used in the past 24 hr; avoid using >2 days/wk, rebound headache may occur

### Evaluation

**Positive therapeutic outcome**
• Absence of migraine headaches

## natamycin ophthalmic

*See Appendix B*

**⚠ HIGH ALERT**

## nebivolol (Rx)

(ne-biv′oh-lol)
**Bystolic**
*Func. class.:* Antihypertensive
*Chem. class.:* $\beta_1$-Blocker

**ACTION:** Competitively blocks stimulation of β-adrenergic receptors within vascular smooth muscle; decreases rate of SA node discharge, increases recovery time, slows conduction of AV node resulting in decreased heart rate (negative chronotropic effect), which decreases $O_2$ consumption in myocardium due to $\beta_1$-receptor antagonism; also decreases renin-aldosterone-angiotensin system at high doses, inhibits $\beta_2$-receptors in bronchial system (high doses)

**Therapeutic outcome:** Decreased B/P after 1-2 wk

**USES:** Hypertension alone or in combination

**Unlabeled uses:** Heart failure

### CONTRAINDICATIONS

Cardiogenic shock, acute sick sinus syndrome, AV heart block, hypersensitivity to this agent or β-blockers, heart failure, severe hepatic disease, severe bradycardia

**Precautions:** Pregnancy, breastfeeding, children, major surgery, peripheral vascular disease, diabetes mellitus, thyrotoxicosis, COPD, asthma, well-compensated heart failure, renal/hepatic disease, abrupt discontinuation, acute bronchospasm

### DOSAGE AND ROUTES

**Hypertension**
**Adult:** PO 5 mg/day, may be increased to desired response q2wk; max 40 mg/day
**Geriatric:** PO max 40 mg/day

**Renal dose**
**Adult:** PO CCr <30 ml/min, 2.5 mg/day; may increase cautiously

**Hepatic dose**
**Adult:** PO (Child-Pugh class B) 2.5 mg qd; use dose escalation cautiously

**Heart failure (unlabeled)**
**Adult:** PO 1.25 mg titrated to max 10 mg/day

**Available forms:** Tabs 2.5, 5, 10, 20 mg

### Implementation

**PO route**
• Give without regard for meals; tab may be crushed or swallowed whole; give with food to prevent GI upset
• Taper over 1-2 wk when discontinuing; minimize physical exertion; if angina recurs give nebivolol
• Store protected from light, moisture; place in cool environment

### ADVERSE EFFECTS

**CNS:** *Insomnia, fatigue, dizziness, mental changes,* drowsiness, *headache*
**CV:** Bradycardia, MI, AV heart block, edema
**GI:** *Nausea, diarrhea,* vomiting, abdominal pain
**GU:** *Impotence*
**HEMA:** Thrombocytopenia
**INTEG:** Rash, pruritus, vasculitis, urticaria, psoriasis, angioedema
**MISC:** Renal failure, pulmonary edema, hyperuricemia, hypercholesterolemia, withdrawal symptoms
**RESP:** Bronchospasm, dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | In liver by CYP2D6 |
| **Excretion** | 38% excreted in urine, 44% in feces |
| **Half-life** | 12 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1.5-4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Cimetidine: increased nebivolol action
Mefloquine: do not give
Sildenafil: decreased nebivolol action

### Drug classifications

β-blockers, others: do not use concurrently
Calcium channel blockers (nondihydropyridine), CYP2D6 inhibitors (amiodarone, buPROPion, chloroquine, chlorpheniramine, chlorproMAZINE, cinacalcet, diphenhydrAMINE, DULoxetine, FLUoxetine, haloperidol, imatinib, PARoxetine, promethazine, propoxyphene, quiNIDine, quiNINE, ritonavir, terbinafine, thioridazine): increased nebivolol action
CYP2D6 inducers (rifampin): decreased nebivolol action

### Drug/herb

Hawthorn: may increase nebivolol effect
Ephedra: decreased nebivolol effect

### Drug/lab test

Increased: serum lipoprotein levels, BUN, potassium, triglyceride, uric acid, LDH, AST, ALT, alkaline phosphatase
Decreased: platelets

## NURSING CONSIDERATIONS

### Assessment

- **Hypertension:** monitor B/P during beginning treatment, periodically thereafter; assess apical/radial pulse before administration; notify prescriber of any significant changes (pulse <50 bpm); **signs of HF** (dyspnea, crackles, weight gain, jugular vein distention)
- Assess baselines in renal/hepatic studies before therapy begins and periodically, do not use in Child-Pugh class >B
- Monitor I&O, edema in feet, legs daily
- Monitor skin turgor, dryness of mucous membranes for hydration status, especially geriatric patients
- Assess blood glucose in diabetics
- Pregnancy/breastfeeding: Use only if benefits outweigh fetal risk, avoid breastfeeding

### Patient/family education

- Caution patient not to discontinue product abruptly; severe cardiac reactions may occur; taper over 2 wk; do not double dose; if a dose is missed, take as soon as remembered up to 4 hr before next dose
- Inform patient product may mask signs of hypoglycemia or alter blood glucose levels
- Advise patient not to use OTC products containing α-adrenergic stimulants (such as nasal decongestants, OTC cold preparations) unless directed by prescriber
- Instruct patient to report low pulse, dizziness, confusion, depression, fever
- Teach patient to take pulse, B/P at home; advise when to notify prescriber
- Advise patient to comply with weight control, dietary adjustments, modified exercise program
- Instruct patient to carry emergency ID to identify product, allergies
- Caution patient to avoid hazardous activities if dizziness, drowsiness are present
- **Instruct patient to report symptoms of HF:** difficulty breathing, especially on exertion or when lying down, night cough, swelling of extremities
- Teach patient to continue with required lifestyle changes (exercise, diet, weight loss, stress reduction)

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P after 1-2 wk
- Decreased dysrhythmias

## TREATMENT OF OVERDOSE:

Lavage, **IV** atropine for bradycardia, **IV** theophylline for bronchospasm, digoxin, $O_2$, diuretic for cardiac failure, **IV** glucose for hypoglycemia, **IV** diazepam (or phenytoin) for seizures, **IV** fluids, **IV** pressors

**RARELY USED**

# nebivolol/valsartan

(ne-bivoh-lol/val-sartan)
**Byvalson**
*Func. class.: Antihypertensive combination*

**USES:** For the treatment of hypertension

## CONTRAINDICATIONS

AV block, bradycardia, cardiogenic shock, heart failure, hepatic disease, sick sinus syndrome

## DOSAGE AND ROUTES

**Adult:** PO 1 tablet of nebivolol/valsartan 5 mg/80 mg qday as initial therapy in those not adequately controlled on valsartan 80 mg or nebivolol, up to and including 10 mg. The combination product may be substituted for its components in patients already receiving 5 mg nebivolol and 80 mg valsartan.

## nelfinavir (Rx)

(nell-fin'a-veer)
**Viracept**
*Func. class.:* Antiretroviral
*Chem. class.:* Protease inhibitor

**Do not confuse:** Viracept/viramune

**ACTION:** Inhibits HIV-1 protease, which prevents maturation of the infectious virus

**USES:** HIV-1 in combination with other antiretrovirals

## CONTRAINDICATIONS

Hypersensitivity to protease inhibitors

**Precautions:** Pregnancy, breastfeeding, hemophilia, PKU, renal/hepatic disease, pancreatitis, diabetes, infection

## DOSAGE AND ROUTES

### HIV infection

**Adult and child >13 yr:** PO 750 mg tid or 1250 mg bid, max 2500 mg/day bid in combination
**Child 2-12 yr:** PO 25-30 mg/kg tid or 45-55 mg/kg bid, max 2500 mg/day bid

### Prevention of HIV infection after exposure (unlabeled)

**Adult:** PO 1250 mg bid with two other antiretroviral agents × 4 wk

**Available forms:** Tabs 250, 625 mg

### Implementation

- Administer with food

## ADVERSE EFFECTS

**CNS:** Headache, asthenia, poor concentration, seizures, suicidal ideation
**CV:** Bleeding
**ENDO:** Hyperglycemia, hyperlipidemia
**GI:** Diarrhea, nausea, anorexia, dyspepsia, *flatulence*, hepatitis, pancreatitis
**HEMA:** Anemia, leukopenia, thrombocytopenia, Hgb abnormalities
**INTEG:** Rash, dermatitis, anaphylaxis
**MS:** Pain, arthralgia, myalgia, myopathy
**OTHER:** Hypoglycemia, redistribution/accumulation of body fat, immune reconstitution syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 98% protein binding |
| **Metabolism** | Liver (minimal) |
| **Excretion** | Feces/urine |
| **Half-life** | 3½-5 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Amiodarone, lovastatin, midazolam, pimozide, quiNIDine, salmeterol, simvastatin, triazolam: increased serious dysrhythmias
Alfentanil, alosetron, atorvastatin, azithromycin, bortezomib, buprenorphine, busPIRone, cilostazol, cycloSPORINE, disopyramide, DOCEtaxel, dofetilide, donepezil, ethosuximide, fentaNYL, galantamine, gefitinib, halofantrine, indinavir, levomethadyl, systemic lidocaine, PACLitaxel, rifabutin, saquinavir, sibutramine, sildenafil, sirolimus, SUFentanil, tacrolimus, traZODone, ziprasidone, zonisamide: increased effect of each product
CarBAMazepine, nevirapine, PHENobarbital, phenytoin, rifamycin: decreased nelfinavir levels
Delavirdine: increased protease inhibitor levels
Didanosine, methadone, phenytoin: decreased effect
Indinavir, ketoconazole, ritonavir: increased nelfinavir levels

### Drug classifications

Calcium channel blockers, tricyclic antidepressants, vinca alkaloids: increased effects
Contraceptives (oral): decreased effect
Ergots: increased serious dysrhythmias
HIV protease inhibitors: increased protease inhibitor levels

### Drug/herb

St. John's wort: decreased antiretroviral effect, do not use concurrently

### Drug/food

Increased: absorption with food

### Drug/lab test

Increased: AST, ALT, alkaline phosphatase, total bilirubin, CPK, LDH, lipids, uric acid
Decreased: WBC, platelets

## NURSING CONSIDERATIONS

### Assessment

- **Pregnancy:** Enroll pregnant patient in Antiretroviral Pregnancy Registry (800-258-4264), use only if potential benefit is greater than risk, do not breastfeed
- **HIV:** Monitor blood studies: serum lipid profile, plasma HIV RNA, blood glucose, viral load, CD4 cell counts baseline, throughout treatment

- Assess resistance testing at initiation and failure of treatment
- Assess signs of infection, anemia
- Monitor liver function tests: ALT, AST
- Assess bowel pattern before, during treatment; if severe abdominal pain with bleeding occurs, product should be discontinued; monitor hydration
- **Anaphylaxis, hypersensitivity reaction:** assess for wheezing, flushing, swelling of lips, tongue, throat, skin eruptions, rash, urticaria, itching
- **Immune reconstitution syndrome:** occurs with combination therapy; includes MAC, CMV, PCP, TB that require treatment
- **Phenylketonuria:** powder contains phenylalanine

### Patient/family education

- Advise patient to take with meal or snack; if dose is missed, take as soon as remembered up to 1 hr before next dose; do not double dose
- Advise patient to avoid taking with other medications, unless directed by prescriber
- Teach patient that diarrhea is the most common side effect; may use loperamide to control
- Teach patient that product does not cure, but manages symptoms; does not prevent transmission of HIV to others
- **Pregnancy:** Teach patient to use nonhormonal form of contraception while taking this product if using contraceptives
- Teach to report symptoms of hyperglycemia
- Advise all providers of this product; advise prescriber of all OTC, Rx, herbal products

### Evaluation

**Positive therapeutic outcome**

- Decreasing symptoms of HIV
- Improving viral load and CD4 cell counts

## nepafenac ophthalmic

*See Appendix B*

## nevirapine (Rx)

(ne-veer'a-peen)
**Viramune, Viramune XR**
*Func. class.:* Antiretroviral
*Chem. class.:* Non-nucleoside reverse transcriptase inhibitor (NNRTI)

**Do not confuse:** nevirapine/nelfinavir, Viramune/Viracept

**ACTION:** Binds directly to reverse transcriptase and blocks RNA, DNA, causing a disruption of the enzyme's site

**Therapeutic outcome:** Improvement of HIV-1 infection

**USES:** HIV-1 in combination with other highly active antiretroviral treatments (HAART) hypersensitivity

## CONTRAINDICATIONS

**BLACK BOX WARNING:** Hepatic disease

**Precautions:** Pregnancy, breastfeeding, children, renal disease, Hispanic patients, hepatitis

**BLACK BOX WARNING:** Females, serious rash

## DOSAGE AND ROUTES

### HIV infection in combination with other antiretrovirals

**Adult and adolescent:** PO 200 mg/day × 2 wk, then 200 mg bid in combination; ext rel tab (adults not currently taking immediate release nevirapine) 200 mg/day (immediate rel tab) × 14 days with other antiretrovirals; if rash develops during lead-in period and persists beyond 14 days, do not use ext rel tab; if no consistent rash is present then give 400 mg/day ext rel tab with other antiretrovirals; if interrupted > 7 days, restart 14-day lead-in dosing; adults switched from immediate-release tab, 400 mg/day ext rel tab
**Neonate ≥15 days old/infant/child:** PO 150 mg/m$^2$/day × 14 days, then 150 mg/m$^2$ bid; max 400 mg/day

### Perinatal transmission prophylaxis (unlabeled)

**Females with no previous antiretroviral therapy:** PO 200 mg as a single dose at onset of labor with zidovudine 2 mg/kg over 1 hr followed by zidovudine 1 mg/kg/hr until delivery
**Neonate ≥34 wk gestation:** PO nevirapine 2 mg/kg as a single dose at age 48-72 hr and PO zidovudine 2 mg/kg q6hr for 6 wk

### Hepatic dose

**Adult:** PO do not use in Child-Pugh B or C

**Available forms:** Tabs 200 mg; oral susp 50 mg/5 ml; ext rel tabs: 400 mg

### Implementation

- Do not initiate treatment in females when CD4 counts >250 cells/mm$^3$, or in males when >400 cells/mm$^3$ unless benefit outweighs risks
- Give without regard to meals
- Use in combination with at least 1 other antiretroviral
- Give at equal intervals around the clock to maintain blood levels

## ADVERSE EFFECTS

**CNS:** *Paresthesia, headache, fever, peripheral neuropathy*
**GI:** *Diarrhea,* abdominal pain, *nausea, stomatitis,* hepatotoxicity, hepatic failure
**HEMA:** Neutropenia, anemia, thrombocytopenia
**INTEG:** *Rash,* toxic epidermal necrolysis
**MISC:** Stevens-Johnson syndrome, anaphylaxis
**MS:** Pain, myalgia, rhabdomyolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid |
| **Distribution** | Protein binding 60% |
| **Metabolism** | Liver, by P450 enzyme system |
| **Excretion** | 91% urine |
| **Half-life** | 25-30 hr 50% removed by peritoneal dialysis; slower clearance rate in Hispanics, African Americans |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Cimetidine: increased nevirapine levels
ClonazePAM, diazepam, warfarin: decreased nevirapine level
Itraconazole: decreased effect of itraconazole
Ketoconazole: decreased effect of ketoconazole
Methadone: decreased effect of methadone

### Drug classifications

Anticonvulsants, rifamycins: decreased nevirapine levels
Antiinfectives, macrolides: increased nevirapine levels
Oral contraceptives, protease inhibitors: decreased action

### Drug/herb

St. John's wort: decreased nevirapine levels, do not use together

### Drug/lab test

Increased: ALT, AST, GGT, bilirubin, Hgb
Decreased: neutrophil count

## NURSING CONSIDERATIONS

### Assessment

- Use resistance testing before starting and when therapy fails

**BLACK BOX WARNING: Hepatotoxicity:** May be fatal, usually occurs within the first 18 wk of treatment, high risk in females

- **Assess signs of infection,** anemia, hepatotoxicity, immune reconstitution syndrome
- **HIV:** Assess liver, renal, blood tests: ALT, AST, viral load, CD4, plasma HIV RNA, glucose levels in diabetic patients; if liver function tests are elevated significantly, product should be withheld; if treatment is interrupted by >1 wk, restart at initial dose
- Assess bowel pattern before, during treatment; if severe abdominal pain with bleeding occurs, product should be discontinued; monitor hydration
- Assess skin eruptions; rash, urticaria, itching; if rash is severe or systemic symptoms occur, discontinue immediately
- Assess allergies before treatment, reaction to each medication
- **Rhabdomyolysis:** assess for pain, tenderness, weakness, edema; product should be discontinued
- Stevens-Johnson syndrome, toxic epidermal necrolysis, assess for allergies before treatment, reaction to each medication; skin eruptions; rash, urticaria, itching; if rash is severe or systemic symptoms occur, discontinue immediately
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding

### Patient/family education

**BLACK BOX WARNING:** Instruct patient to report immediately any right quadrant pain, yellowing of eyes/skin, dark urine, nausea, anorexia, muscle pain/tenderness, rash

- Inform patient that product may be taken with food, antacids
- Advise patient to take as prescribed; if dose is missed, take as soon as remembered up to 1 hr before next dose; do not double dose
- Advise patient that product must be taken in equal intervals around the clock to maintain blood levels for duration of therapy
- Advise patient that product is not a cure, controls symptoms of HIV, does not prevent transmission
- Instruct patient to avoid OTC agents unless approved by prescriber
- Advise patients who are using contraceptives to use a nonhormonal form of contraception during treatment

### Evaluation

**Positive therapeutic outcome**
- Improving viral load and CD4 cell counts
- Absence of AIDS-defining symptoms
- Improvement in quality of life

**RARELY USED**

## niacin (Rx, OTC)
(nye'a-sin)
**Equaline Niacin, Niaspan, Ni-Odan 🍁, Slo-Niacin**

## niacinamide (Rx, OTC)
(nye-a-sin'a-mide)
*Func. class.:* Vitamin $B_3$ lipid-lowering product
*Chem. class.:* Water-soluble vitamin

**Therapeutic outcome:** Decreasing cholesterol and LDL levels, $B_3$ supplementation

**USES:** Pellagra, hyperlipidemias (types IV, V), peripheral vascular disease that presents a risk for pancreatitis

### CONTRAINDICATIONS
Breastfeeding, hypersensitivity, peptic ulcer, hepatic disease, hemorrhage, severe hypotension

### DOSAGE AND ROUTES
#### Niacin deficiency
**Adult:** PO 100-500 mg/day in divided doses; IM/SUBCUT 50-100 mg 5 or more times a day; **IV** 25-100 mg bid or tid
**Child:** PO up to 300 mg/day in divided doses

#### Adjunct in hyperlipidemia
**Adult:** 250 mg after evening meal, may increase dosage at 1-4 wk intervals to 1-2 g tid, max 6 g/day; ext rel 500 mg at bedtime, ×4 wk, then 1000 mg at bedtime for wk 5-8, do not increase by more than 500 mg q4wk, max 2000 mg/day

#### Pellagra
**Adult:** PO 300-500 mg/day in divided doses, IM 50-100 mg 5 ×/day or IV 25-100 mg bid by slow IV INF
**Child:** PO 100-300 mg/day in divided doses; IV up to 300 mg/day by slow IV/INF

#### Peripheral vascular disease (unlabeled)
**Adult:** PO 250-800 mg/day in 3-5 divided doses

## niCARdipine (Rx)
(nye-card'i-peen)
**Cardene IV, Cardene SR**
*Func. class.:* Calcium channel blocker, antianginal, antihypertensive
*Chem. class.:* Dihydropyridine

**Do not confuse:** niCARdipine/NIFEdipine, Cardene/Cardizem

**ACTION:** Inhibits calcium ion influx across cell membrane during cardiac depolarization, produces relaxation of coronary vascular smooth muscle and peripheral vascular smooth muscle, dilates coronary arteries, increases myocardial oxygen delivery in patients with vasospastic angina

**Therapeutic outcome:** Decreased angina pectoris, decreased B/P in hypertension

**USES:** Chronic stable angina pectoris, hypertension

### CONTRAINDICATIONS
Sick sinus syndrome, 2nd- or 3rd-degree heart block, hypersensitivity to this product or dihydropyridine, advanced aortic stenosis

**Precautions:** Pregnancy, breastfeeding, children, geriatric, HF, hypotension, hepatic injury, renal disease

### DOSAGE AND ROUTES
#### Hypertension
**Adult:** PO 20 mg tid initially; may increase after 3 days (range 20-40 mg tid) or SUS REL 30 mg bid; may increase to 60 mg bid **IV** 5 mg/hr; may increase by 2.5 mg/hr q15min; max 15 mg/hr

#### Angina
**Adult:** PO 20 mg tid, may be adjusted q3day, may use 20-40 mg tid

#### Renal dose
**Adult:** PO 20 mg tid or SUS REL 30 mg bid

#### Hepatic dose
**Adult:** PO 20 mg bid

**Available forms:** Caps 20, 30 mg; sus rel caps 30, 45, 60 mg; inj 2.5 mg/ml, premixed 20 mg/200 ml, 40 mg/200 ml

#### Implementation
**PO route**
- Do not break, crush, chew, or open sus rel caps
- Give without regard to meals
- To start PO give 1 hr before discontinuing IV nicardipine
- Store in airtight container at room temperature

**IV route**
- To convert/substitute PO to IV for adults, if PO 20 mg q8hr, start infusion at 0.5 mg/hr; if PO 30 mg q8hr, start infusion at 1.2 mg/hr; if PO 40 mg q8hr, start infusion at 2.2 mg/hr
- Dilute each 25 mg/240 ml of compatible sol (0.1 mg/ml), give slowly, titrate to patient's response, stable for 24 hr at room temperature, change IV site q12 hrs

**Solution compatibilities:** $D_5W$, $D_5$/0.45% NaCl, $D_5$/0.9% NaCl

**Y-site compatibilities:** Alemtuzumab, amikacin, aminophylline, aztreonam, bivalirudin, butorphanol, calcium gluconate, CARBOplatin, caspofungin, ceFAZolin, ceftizoxime, chloramphenicol, cimetidine, CISplatin, clindamycin, cytarabine, DAPTOmycin, dexmedetomidine, diltiazem, DOBUTamine, DOCEtaxel, DOPamine, DOXOrubicin hydrochloride, enalaprilat, EPINEPHrine, epirubicin, erythromycin, esmolol, famotidine, fenoldopam, fentaNYL, gentamicin, hydrocortisone, HYDROmorphone, labetalol, lidocaine, linezolid, LORazepam, magnesium sulfate, mechlorethamine, methylPREDNISolone, metroNIDAZOLE, midazolam, milrinone, morphine, nafcillin, nesiritide, nitroglycerin, nitroprusside, norepinephrine, octreotide, oxaliplatin, oxytocin, palonosetron, penicillin G potassium, potassium chloride/phosphate, quinupristin-dalfopristin, ranitidine, rocuronium, tacrolimus, tirofiban, tobramycin, trimethoprim/sulfamethoxazole, vancomycin, vasopressin, vecuronium, vinCRIStine, voriconazole, zoledronic acid

**Y-site incompatibilities:** Amphotericin B liposome/lipid complex, ampicillin, ampicillin/sulbactam, cefepime, cefoperazone, ertapenem, fluorouracil, furosemide, methotrexate, micafungin, pantoprazole, PEMEtrexed, thiopental, thiotepa, tigecycline

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness,* anxiety, depression, confusion, paresthesia, somnolence, *flushing*
**CV:** Edema, bradycardia, hypotension, palpitations, pulmonary edema, chest pain, tachycardia, increased angina, arrhythmias, HF
**GI:** Nausea, vomiting, gastric upset, constipation, hepatitis, abdominal cramps, dry mouth, sore throat
**GU:** Nocturia, polyuria
**INTEG:** Rash, infusion site discomfort, Stevens-Johnson syndrome
**MISC:** Blurred vision, flushing, sweating, SOB, impotence

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO); bioavailability poor |
| **Distribution** | Unknown |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys 60%, feces 35% |
| **Half-life** | 2-5 hr |

### Pharmacodynamics

| | PO | PO SUS REL | IV |
|---|---|---|---|
| **Onset** | 20 min | Unknown | 1 min |
| **Peak** | 1-2 hr | | 45 min |
| **Duration** | 8 hr | 10-12 hr | |

## INTERACTIONS

### Individual drugs

Alcohol: increased hypotension
CarBAMazepine, cycloSPORIINE, prazosin, propranolol, quiNIDine: increased risk of toxicity
Cimetidine: increased niCARdipine effects
Digoxin, quiNIDine, theophylline: increased effects
Rifampin: decreased antihypertensive effect

### Drug classifications

Antihypertensives, neuromuscular blocking agents, nitrates: increased hypotension
NSAIDs: decreased antihypertensive effect

### Drug/herb

Ginkgo, ginseng, hawthorn: increased effect
Ephedra, melatonin, St. John's wort, yohimbe: decreased effect

### Drug/food

Grapefruit juice, grapefruit: increased hypotensive effect

### Drug/lab test

Increased: LFTs
Decreased: potassium (IV), phosphate, platelets

## NURSING CONSIDERATIONS

### Assessment

- Assess fluid volume status (I&O ratio) and record weight, color, quality, and specific gravity of urine, skin turgor, adequacy of pulses, moist mucous membranes, bilateral lung sounds, peripheral pitting edema; dehydration symptoms of decreasing output, thirst, hypotension, dry mouth, and mucous membranes should be reported
- **Monitor for HF:** weight gain, crackles, peripheral edema jugular venous distention, dyspnea
- **Allergic reactions (Stevens-Johnson syndrome):** If rash is severe with and accompanied by joint aches, mouth lesions, discontinue immediately

• **Hypertension:** assess for decreasing B/P; salt in diet, smoking, exercise, diet, weight, monitor B/P baseline and often
• **Assess anginal pain:** intensity, location, duration, alleviating factors
• Monitor potassium, renal/liver function tests, periodically if on long-term treatment
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding

### Patient/family education

• Advise patient to avoid hazardous activities until stabilized on product and dizziness is no longer a problem
• Instruct patient to limit caffeine consumption; to avoid alcohol and OTC products unless directed by a prescriber, to take without regard to food, avoid high-fat foods, to swallow sus rel product whole
• **Hypertension:** instruct patient to comply with all areas of medical regimen: diet, exercise, stress reduction, product therapy
• Instruct patient to notify prescriber of irregular heartbeat, shortness of breath, swelling of feet and hands, pronounced dizziness, constipation, nausea, hypotension, change in severity/pattern/incidence of angina
• Teach patient to use medication as directed even if feeling better; may be taken with other cardiovascular products (nitrates, β-blockers)
• Teach patient to take medication exactly as prescribed
• Advise patient to contact prescriber if anginal attacks continue or become worse

### Evaluation

**Positive therapeutic outcome**
• Decreased angina attacks
• Decreased B/P

## TREATMENT OF OVERDOSE:

Defibrillation, atropine for AV block, vasopressor for hypotension

## nicotinamide

*See niacin*

## nicotine

(nik′o-teen)

## nicotine chewing gum

**Nicorette, Thrive**

## nicotine inhaler (OTC, Rx)

**Nicotrol Inhaler**

## nicotine lozenge (OTC)

**Commit, Nicorette**

## nicotine nasal spray (Rx)

**Nicotrol NS**

## nicotine transdermal (OTC, Rx)

**Nicoderm CQ**

*Func. class.:* Smoking deterrent
*Chem. class.:* Ganglionic cholinergic agonist

## ACTION:

Agonist at nicotinic receptors in the peripheral and central nervous systems; acts at sympathetic ganglia, on chemoreceptors of the aorta and carotid bodies; also affects adrenaline-releasing catecholamines

**Therapeutic outcome:** Decreased withdrawal effects when smoking cessation is attempted

## USES:

Deter cigarette smoking

**Unlabeled uses:** Tourette's syndrome

## CONTRAINDICATIONS

Pregnancy (transdermal, inhaler), hypersensitivity, immediate post-MI recovery period, severe angina pectoris

**Precautions:** Pregnancy (gum), breastfeeding, vasospastic disease, dysrhythmias, diabetes mellitus, hyperthyroidism, pheochromocytoma, coronary disease, esophagitis, peptic ulcer, renal/hepatic disease; MRI (patch); soy hypersensitivity (mint lozenge)

## DOSAGE AND ROUTES

### Nicotine chewing gum

**Adult:** If patient smokes ≤25 cigarettes/day, start with 2 mg gum; if >25 cigarettes/day, start with 4 mg gum; then 1 piece of gum q1-2hr × 6 wk, then 1 piece of gum q2-4hr × 2 wk, then 1 piece of gum q4-8hr × 2 wk, then discontinue; max 24/day

### Nicotine inhaler

**Adult:** Inhale 6 cartridges/day for first 3-6 wk, max 16/day × 12 wk

### Nicotine lozenge

**Adult:** If cigarette is desired >30 min after awakening, start with 1-2–mg lozenge; if <30 min after awakening, start with 4-mg lozenge; then 1 q1-2hr, max 20 lozenges/day or 5 lozenges/6 hr × 6 wk, then 1 lozenge q2-4hr × 2 wk, then 1 lozenge q4-8hr × 2 wk, then discontinue

### Nicotine nasal spray

**Adult:** 1 spray in each nostril 1-2 ×/hr, max 5 ×/hr or 40 ×/day, max 3 mo

## Nicotine transdermal/inhaler system

### NicoDerm
**Adult:** 21 mg/day × 4-8 wk; 14 mg/day × 2-4 wk; 7 mg/day × 2-4 wk

### Nicotrol
**Adult:** 15 mg/day × 12 wk; 10 mg/day × 2 wk; 5 mg/day × 2 wk

### Nicotrol inhaler
**Adult:** Delivers 30% of what a smoker receives from an actual cigarette

### Tourette's syndrome (unlabeled)
**Adult and child:** Chewing gum 2 mg chewed × ½ hr bid × 1-6 mo; transdermal 7 or 10 mg patch daily × 2 days

**Available forms:** Gum: 2, 4 mg/piece; nicotine transdermal system (NicoDerm, Nicotine Transdermal System); 7, 14, 21 mg/day delivered; (NicoDerm) 5, 10, 15 mg/day; nicotine inhaler: 4 mg delivered; nasal spray: 0.5 mg of nicotine/actuation; lozenge: 2 mg, 4 mg

### Implementation
- Give only prescribed amount, or toxicity may occur
- **Gum:** chew gum slowly for 30 min to promote buccal absorption of the product; do not chew > 45 min
- Begin product withdrawal after 3 mo of use; do not exceed 6 mo
- Do not expose to light, gum will turn color
- **Transdermal patch:** apply once a day to a nonhairy, clean, dry area of skin on upper body or upper outer arm; rotate sites to prevent skin irritation, can remove before bed if patient has strange dreams
- **Nasal spray/Inhaler:** puffing on mouthpiece delivers nicotine through the mouth
- **Lozenge:** Allow to dissolve slowly

## ADVERSE EFFECTS
**CNS:** Dizziness, vertigo, insomnia, headache, confusion, seizures, depression, euphoria, numbness, tinnitus, strange dreams
**CV:** Dysrhythmias, tachycardia, palpitations, edema, flushing, hypertension
**EENT:** Jaw ache, irritation in buccal cavity
**GI:** *Nausea, vomiting, anorexia, indigestion,* diarrhea, abdominal pain, constipation, eructation, irritation
**RESP:** Breathing difficulty, cough, hoarseness, sneezing, wheezing, bronchial spasm

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Slowly absorbed, buccal cavity |
| **Distribution** | Unknown |
| **Metabolism** | Liver; some by lungs, kidneys |
| **Excretion** | Kidneys, unchanged (20%); breast milk |
| **Half-life** | 1-2 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | ½ hr |
| **Duration** | Unknown |

## INTERACTIONS
### Individual drugs
Bromocriptine, cabergoline: increased vasoconstriction
Adenosine: increased effects
BuPROPion: increased B/P
Insulin: decreased effect
Cimetidine: decreased nicotine clearance

### Drug classifications
Ergots: increased vasoconstriction
α-Blockers: decreased effect

### Drug/food
Acidic foods (colas, coffee): avoid use of gum with and for 15 min after

## NURSING CONSIDERATIONS
### Assessment
- **Assess for adverse reaction to gum:** irritation of buccal cavity, dislike of taste, jaw ache
- **Assess for withdrawal symptoms:** headache, fatigue, drowsiness, restlessness, irritability, severe cravings for nicotine products before, during, and after treatment
- **Smoking:** obtain a nicotine assessment: brand of cigarettes, chewing tobacco, cigars, number of each used per day; what increases need or activities performed when each is used
- **Toxicity:** Assess for nausea, vomiting, diarrhea, headache, dizziness, dyspnea, hypotension
- Gum should not be used if temporomandibular condition exists
- **Assess for nicotine toxicity:** GI symptoms (nausea, vomiting, diarrhea), cardiopulmonary symptoms (decreased B/P, dyspnea, change in pulse), weakness, abdominal cramping, headache, blurred vision, tinnitus; product should be discontinued

• **Pregnancy/breastfeeding:** Whenever possible, avoid in pregnancy, cautious use in breastfeeding

### Patient/family education

• **Toxicity:** Teach patient signs of toxicity: nausea, vomiting, diarrhea, headache, dizziness, dyspnea, hypotension
• Advise patient to begin product withdrawal after 3 mo use; max 6 mo
• Teach patient all aspects of product; give package insert to patient and explain; caution patient not to exceed prescribed dose
• Caution patient not to use during pregnancy; birth defects may occur
• Discontinue if patient is unable to stop smoking after fourth week of therapy

**Gum**

• Advise patient to chew gum slowly for 30 min to promote buccal absorption of the product; do not chew over 45 min
• Inform patient that gum will not stick to dentures, dental appliances
• Caution patient that gum is as toxic as cigarettes; it is to be used only to deter smoking

**Transdermal patch**

• Caution patient that patch is as toxic as cigarettes; to be used only to deter smoking
• Caution patient not to use during pregnancy; birth defects may occur
• Instruct patient to keep used and unused system out of reach of children and pets
• Instruct patient to apply once a day to a non-hairy, clean, dry area of skin on upper body or upper outer arm; to rotate sites to prevent skin irritation
• Instruct patient to stop smoking immediately when beginning patch treatment
• Teach patient to apply promptly after removing from protective pouch; system may lose strength
• **Nasal spray:** tilt head back, do not swallow, do not chew or inhale during administration; after smoking is stopped, use spray up to 8 wk, then discontinue over 6 wk by tapering
• **Lozenges:** allow to dissolve, avoid swallowing
• **Inhalation:** use the inhaler for 20 min by frequent puffs
• Advise patient that puffing on mouthpiece delivers nicotine through the mouth lining

### Evaluation

**Positive therapeutic outcome**

• Decrease in urge to smoke
• Decreased need for gum after 3-6 mo

## NIFEdipine (Rx)

(nye-fed'i-peen)
**Adalat CC, Adalat XL, Afeditab CR, Nifedical XL Procardia, Procardia XL**
*Func. class.:* Calcium channel blocker, antianginal, antihypertensive
*Chem. class.:* Dihydropyridine

**Do not confuse:** NIFEdipine/niCARdipine/niMODipine Procardia XL/Protain XL

**ACTION:** Inhibits calcium ion influx across cell membrane during cardiac depolarization, produces relaxation of coronary vascular smooth muscle, dilates coronary vascular arteries, increases myocardial oxygen delivery in patients with vasospastic angina, dilates peripheral arteries

**Therapeutic outcome:** Decreased angina pectoris, decreased B/P in hypertension

**USES:** Chronic stable angina pectoris, variant angina, hypertension, migraine prophylaxis

### CONTRAINDICATIONS

Hypersensitivity to this product or dihydropyridine, cardiogenic shock

**Precautions:** Pregnancy, breastfeeding, children, hypotension, sick sinus syndrome, 2nd- or 3rd-degree heart block, hypotension less than 90 mm Hg systolic, hepatic injury, renal disease, acute MI, aortic stenosis, GERD, heart failure

### DOSAGE AND ROUTES

**Adult:** PO immediate release, 10 mg tid; increase in 10-mg increments q7-14day, max 180 mg/24 hr or single dose of 30 mg; sus rel 30-60 mg/day; may increase q7-14day; doses >120 mg not recommended

**Hypertension**

**Adult:** PO ext rel 30-60 mg qd, titrate upward as needed; max 90 mg/day (Adalat CC); 120 mg/day (Procardia XL)
**Adolescent/child (unlabeled):** PO ext rel 0.25-0.5 mg/kg/day, max 3 mg/kg/day

**Hiccups (unlabeled)**

**Adult:** PO 10-20 mg tid

**Available forms:** Caps 10, 20 mg; ext rel tabs (CC, XL) 30, 60, 90 mg

### Implementation

**PO route**

• Do not use immediate release caps within 7 days of MI, coronary syndrome; do not use SL caps to reduce severe hypertension, may cause death
• Give without regard to meals

• Store in airtight container at room temperature
• Protect caps from direct light, keep in dry area, do not freeze

**Sublingual route**

• Using a sterile needle, puncture the cap and squeeze medication in buccal/sublingual area (not an FDA-approved use), do not use in severe hypertension, may be fatal

## ADVERSE EFFECTS

**CNS:** *Headache,* fatigue, drowsiness, *dizziness,* anxiety, depression, weakness, insomnia, *light-headedness,* paresthesia, tinnitus, blurred vision, nervousness, tremor, flushing
**CV:** Dysrhythmias, edema, hypotension, palpitations, tachycardia
**GI:** *Nausea,* vomiting, diarrhea, gastric upset, constipation, increased LFTs, dry mouth, flatulence, gingival hyperplasia
**GU:** Nocturia, polyuria
**HEMA:** Bruising, bleeding, petechiae
**INTEG:** Rash, pruritus, *flushing,* hair loss, Stevens-Johnson syndrome, toxic epidermal necrolysis, exfoliative dermatitis
**MISC:** Sexual difficulties, cough, fever, chills

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO) |
| **Distribution** | Protein binding 92% |
| **Metabolism** | Liver, extensively |
| **Excretion** | Unknown |
| **Half-life** | 2-5 hr |

### Pharmacodynamics

| | PO | PO EXT REL |
|---|---|---|
| **Onset** | 20 min | Unknown |
| **Peak** | 30 min-1 hr | 6 hr |
| **Duration** | 6-8 hr | 24 hr |

## INTERACTIONS

### Individual drugs

Cimetidine, ranitidine: increased risk of toxicity
CarBAMazepine, cycloSPORINE, phenytoin, prazosin, digoxin: increased levels of each product
QuiNIDine: decreased effects
Smoking: decreased NIFEdipine level

### Drug classifications

Strong CYP3A4 inducers: use is contraindicated
Antihypertensives, β-adrenergic blockers: increased effects
NSAIDs: decreased antihypertensive effect

### Drug/herb

Ginkgo biloba, ginseng, hawthorn: increased effect
Ephedra, melatonin, St. John's wort, yohimbe: decreased effect

### Drug/food

Grapefruit juice: increased NIFEdipine level

### Drug/lab test

Positive: ANA titer, direct Coombs' test
Increased: CPK, LDH, AST

## NURSING CONSIDERATIONS

### Assessment

• **Assess anginal pain:** location, intensity, duration, character, alleviating, aggravating factors
• **HF:** Peripheral edema, dyspnea, weight gain >5 lb, jugular venous distention, rales; monitor I&O ratios, daily weight
• Assess for bruising, petechiae, bleeding
• Monitor potassium, renal/liver function tests periodically during treatment; in those taking antihypertensives, beta blockers, monitor B/P often
• **Serious skin disorders:** rash starts suddenly, assess for fever, cutaneous lesions, may have pustules; discontinue product if rash present or if rash is severe, fatigue
• Assess fluid volume status (I&O ratio) and record weight, distended red veins, crackles in lung, color, quality, and specific gravity of urine, skin turgor, adequacy of pulses, moist mucous membranes, bilateral lung sounds, peripheral pitting edema; dehydration symptoms of decreasing output, thirst, hypotension, dry mouth, and mucous membranes should be reported
• Monitor cardiac status: B/P, pulse, respirations, ECG
• **GI obstruction:** ext rel products have been associated with rare reports of obstruction in those with strictures, and no known GI disease
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed
• **Beers:** Avoid in older adults, potential for hypotension, myocardial ischemia

### Patient/family education

• Advise patient to avoid hazardous activities until stabilized on product and dizziness is no longer a problem
• Instruct patient to limit caffeine consumption; to avoid alcohol and OTC products unless directed by prescriber
• Advise patient that empty tab shells may appear in stools and are not significant
• Give without regard to meals (exception: Adelat CC should be taken on empty stomach)
• **Hypertension:** instruct patient to comply in all areas of medical regimen: diet, exercise, stress reduction, product therapy
• Tell patient to notify prescriber of irregular heartbeat, SOB, swelling of feet and hands, pronounced dizziness, constipation, nausea,

hypotension, severe rash, changes in pattern/frequency/severity of angina
• Teach patient to use as directed even if feeling better; may be taken with other cardiovascular products (nitrates, β-blockers)
• Advise patient to increase fluid intake to prevent constipation
• Teach patient to check for gingival hyperplasia and report promptly
• Teach patient not to discontinue abruptly; gradually taper

### Evaluation

**Positive therapeutic outcome**
• Decreased angina attacks
• Decreased B/P

## TREATMENT OF OVERDOSE:
Defibrillation, atropine for AV block, vasopressor for hypotension

**⚠ HIGH ALERT**

## nilotinib (Rx)
(nye-loe'ti-nib)
**Tasigna**
*Func. class.:* Antineoplastic—miscellaneous
*Chem. class.:* Protein-tyrosine kinase inhibitor

## ACTION:
Inhibits BCR-ABL tyrosine kinase created in chronic myeloid leukemia (CML)

**Therapeutic outcome:** Decrease in progression of disease

## USES:
Chronic phase/accelerated phase Philadelphia chromosome–positive chronic myelogenous leukemia that is resistant/intolerant to imatinib

## CONTRAINDICATIONS
Pregnancy, breastfeeding, hypersensitivity

**BLACK BOX WARNING:** Hypokalemia, hypomagnesemia, QT prolongation, QT syndrome

**Precautions:** Children, women, geriatric patients, active infections, anemia, cardiac disease, bone marrow suppression, cholestasis, diabetes, gelatin hypersensitivity, infertility, galactose-free diet, lactase deficiency, neutropenia, pancreatitis, thrombocytopenia alcoholism, angina, ascites, tumor lysis syndrome, hepatic disease

## DOSAGE AND ROUTES
**Adult:** PO 400 mg q12h; continue until disease progression or unacceptable toxicity

### Escalation regimen for those taking a strong CYP3A4 inducer
**Adult:** PO increase dose as required

### Adjustment following discontinuation of a strong CYP3A4 inducer
**Adult:** PO reduce to 400 mg/bid

### Use with a strong CYP3A4 inhibitor
**Adult:** PO reduce dose to 400 mg/day

### QT prolongation
**QTcF >480 msec:** Withhold dose

### Myelosuppression
**ANC 1 × $10^9$/L or platelets <50 × $10^9$/L:** Withhold dose

### Hepatic Dose
**Adult:** PO (Child-Pugh classes A-C): newly diagnosed CML 200 mg bid, then escalation to 300 mg bid initially

**Available forms:** Caps 150, 200 mg

### Implementation
• Do not break, crush, or chew caps; if a whole capsule cannot be swallowed, disperse capsule contents in 1 tsp of applesauce
• Give without regard to meals; separate doses by 12 hr; a make-up dose should not be taken if a dose is missed
• Store at 15°-30° C (59°-86° F)

## ADVERSE EFFECTS
**CNS:** Headache, dizziness, fatigue, fever, flushing, paresthesia
**CV:** QT prolongation, palpitations, torsades de pointes, AV block
**GI:** *Nausea,* hepatotoxicity, vomiting, dyspepsia, *anorexia, abdominal pain,* constipation, pancreatitis, diarrhea, xerostomia
**HEMA:** Neutropenia, thrombocytopenia, anemia, pancytopenia
**INTEG:** *Rash,* alopecia, erythema
**META:** Hyperamylasemia, hyperbilirubinemia, hyperglycemia, hyperkalemia, hypocalcemia, hyponatremia, hypomagnesemia
**MISC:** Diaphoresis, anxiety
**MS:** Arthralgia, myalgia, back/bone pain, muscle cramps
**RESP:** Cough, dyspnea
**SYST:** Bleeding, tumor lysis syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 98%, plasma levels 3 hr |
| **Metabolism** | By CYP3A4 |
| **Excretion** | Unknown |
| **Half-life** | Elimination 17 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

• Product interactions are numerous

Acetaminophen: increased hepatotoxicity

CarBAMazepine, dexamethasone, PHENobarbital, phenytoin, rifampin: decreased concentrations

Clarithromycin, erythromycin, itraconazole, ketoconazole: increased concentrations

Haloperidol, chloroquine, droperidol, pentamidine, arsenic trioxide, levomethadyl: increased QT prolongation

Pimozide, ziprasidone: do not use concurrently

Simvastatin: increased plasma concentrations

Warfarin: increased plasma concentration; avoid use with warfarin, use low-molecular-weight anticoagulants instead

### Drug classifications

Class IA/III antidysrhythmics, some phenothiazines, β-agonists, local anesthetics, tricyclics, CYP3A4 inhibitors (amiodarone, clarithromycin, erythromycin, telithromycin, troleandomycin), CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone): increased QT prolongation

Calcium channel blockers: increased plasma concentrations

Phenothiazines: do not use concurrently

### Drug/herb

St. John's wort: decreased concentration

### Drug/food

Grapefruit juice: increased plasma concentrations

## NURSING CONSIDERATIONS

### Assessment

• Assess ANC and platelets; if ANC $<1 \times 10^9$/L and/or platelets $<50 \times 10^9$/L, stop until ANC $>1.5 \times 10^9$/L and platelets $>75 \times 10^9$/L

• **Monitor CV status:** hypertension, QT prolongation can occur; monitor left ventricular ejection fraction (LVEF) baseline periodically

• **Assess for renal toxicity:** if bilirubin $>3 \times$ IULN, withhold until bilirubin levels return to $<1.5 \times$ IULN

• **Assess for hepatotoxicity:** monitor hepatic function tests, before treatment and qmo; if liver transaminases $>5 \times$ IULN, withhold until transaminase levels return to $<2.5 \times$ IULN

• **Myelosuppression:** Monitor CBC $\times$ 2 mo and then monthly; differential, platelet count weekly; withhold product if WBC is $<3500/mm^3$ or platelet count $<100,000/mm^3$; notify prescriber of these results; product should be discontinued

• Monitor for bleeding: epistaxis, rectal, gingival, upper GI, genital, and wound bleeding; tumor-related hemorrhage may occur rapidly

• **Tumor lysis syndrome:** maintain hydration, correct uric acid prior to use of this product

• **Monitor electrolytes:** calcium, potassium, magnesium, sodium; lipase, phosphate; hypokalemia, hypomagnesemia should be corrected prior to use

• AST/ALT/bilirubin/lipase/amylase if increased to grade 3, withhold product; resume at 400 mg qd when levels return to grade 1 or below

• **QT prolongation:** ECG for QT prolongation, ejection fraction; assess for chest pain, palpitations, dyspnea

• **Pregnancy/breastfeeding:** Not to use in pregnancy, breastfeeding

### Patient/family education

• **Infection:** Teach patient to report immediately cough, fever, chills

• Instruct patient to report bleeding, bleeding gums, blood in stools, urine, emesis

• Instruct patient to report adverse reactions immediately: SOB, bleeding

• Inform patient reason for treatment, expected result

• Advise patient that many adverse reactions may occur

• Teach patient to avoid persons with known upper respiratory infections; immunosuppression is common

• Instruct in signs/symptoms of low potassium or magnesium

• **Pregnancy:** Use contraception during treatment, do not breastfeed

• Teach patient to notify prescriber of all OTC, Rx, herbal products used; not to receive vaccinations without prescriber's approval

### Evaluation

**Positive therapeutic outcome**

• Decrease in progression of disease

## niMODipine (Rx)

(ni-moe'dip-een)

**Nimotop, Nymalize**

*Func. class.:* Calcium channel blocker

*Chem. class.:* Dihydropyridine

**ACTION:** Unknown, may have greater effect on cerebral arteries

**Therapeutic outcome:** Prevention of vascular spasm (subarachnoid hemorrhage)

**USES:** Prevention of cerebrovascular spasm in subarachnoid hemorrhage

## CONTRAINDICATIONS
Sick sinus syndrome, 2nd- or 3rd-degree heart block, hypotension less than 90 mm Hg systolic, hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, geriatric, HF, hypotension, hepatic injury, renal disease

## DOSAGE AND ROUTES
**Adult:** PO begin therapy within 96 hr, 60 mg q4hr × 21 days

**Available forms:** Caps 30 mg

### Implementation
- May puncture cap and dilute in water and give through nasogastric tube; flush tube with 0.9% NaCl
- Store in airtight container at room temperature

## ADVERSE EFFECTS
**CNS:** Headache, fatigue, drowsiness, dizziness, anxiety, depression, weakness, insomnia, confusion, paresthesia, somnolence
**CV:** Dysrhythmia, edema, HF, bradycardia, hypotension, palpitations, MI, pulmonary edema
**GI:** Nausea, vomiting, diarrhea, gastric upset, constipation, hepatitis, abdominal cramps
**GU:** Nocturia, polyuria, acute renal failure
**INTEG:** Rash, pruritus, urticaria, photosensitivity, hair loss
**MISC:** Blurred vision, flushing, nasal congestion, sweating, shortness of breath, gynecomastia, hyperglycemia, sexual difficulties

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed, poor bioavailability |
| **Distribution** | Crosses blood-brain barrier |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys |
| **Half-life** | 1-2 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1 hr |
| **Duration** | Unknown |

## INTERACTIONS
### Individual drugs
Alcohol: increased hypotension
Digoxin: increased digoxin levels, bradycardia
PHENobarbital, phenytoin: decreased effectiveness
Propranolol: increased toxicity

### Drug classifications
Antihypertensives: increased hypotension
β-Adrenergic blockers: increased bradycardia
Nitrates: increased nitrates

### Drug/herb
Barberry, betel palm, burdock, goldenseal, khat, khella, lily of the valley, plantain: increased effect
Yohimbe: decreased effect

## NURSING CONSIDERATIONS
### Assessment
- Assess fluid volume status (I&O ratio) and record weight; distended red veins; crackles in lung; color, quality, and specific gravity of urine; skin turgor; adequacy of pulses; moist mucous membranes; bilateral lung sounds; peripheral pitting edema; dehydration symptoms of decreasing output, thirst, hypotension, dry mouth and mucous membranes should be reported
- Monitor B/P and pulse; if B/P drops 30 mm Hg, call prescriber
- Monitor ALT, AST, bilirubin daily; if these are elevated, hepatotoxicity is suspected

### Nursing diagnoses
- Injury, risk for (uses)
- Knowledge, deficient (teaching)

### Evaluation
**Positive therapeutic outcome**
- Prevention of neurologic damage from subarachnoid hemorrhage

N

## nitrofurantoin (Rx)
(nye-troe-fyoor′an-toyn)
**Furadantin, Macrobid, Macrodantin, Novo-Furantoin**
*Func. class.:* Urinary tract antiinfective
*Chem. class.:* Synthetic nitrofuran derivative

**ACTION:** Inhibits bacterial acetyl-CoA from interfering with carbohydrate metabolism

**Therapeutic outcome:** Resolution of infection

**USES:** Urinary tract infections caused by *Escherichia coli, Klebsiella, Pseudomonas, Proteus vulgaris, Proteus morganii, Serratia, Citrobacter, Staphylococcus aureus, Staphylococcus epidermidis, Enterococcus, Salmonella, Shigella*

## CONTRAINDICATIONS
Infants <1 mo, hypersensitivity, anuria, severe renal disease, CCr <60 ml/min, at term pregnancy (38-42 wk), labor, delivery, cholestatic jaundice due to nitrofurantoin therapy

**Precautions:** Pregnancy, breastfeeding, geriatric, G6PD deficiency, GI disease, diabetes

## DOSAGE AND ROUTES

### Active infections

**Adult:** PO 50-100 mg qid after meals or 50-100 mg at bedtime for long-term treatment
**Child:** PO 5-7 mg/kg/day in 4 divided doses; 1-2 mg/kg/day for long-term treatment; max 7 mg/kg/day

### Chronic suppression

**Adult:** PO 50-100 mg QPM
**Child:** PO 2 mg/kg/day QPM or 0.5-1 mg/kg q12hr if dose is not well tolerated

**Available forms:** Caps 25, 50, 100 mg; susp 25 mg/ml; macrocrystal caps (Macrodantin) 25, 50, 100 mg; cap (Macrobid) 100 mg (25 macrocrystals, 75 monohydrate)

### Implementation

- Give with meals
- Do not break, crush, chew, or open tabs, caps; store in original container
- Give after clean-catch urine for C&S
- Give two daily doses if urine output is high or if patient has diabetes

## ADVERSE EFFECTS

**CNS:** *Dizziness, headache*, drowsiness, peripheral neuropathy, chills, confusion, vertigo
**CV:** Bundle branch block, chest pain
**GI:** *Nausea, vomiting, abdominal pain, diarrhea,* cholestatic jaundice, loss of appetite, pseudomembranous colitis, hepatitis, pancreatitis
**HEMA:** Anemia, agranulocytosis, hemolytic anemia, leukopenia, thrombocytopenia
**INTEG:** Pruritus, rash, urticaria, angioedema, alopecia, tooth staining, exfoliative dermatitis
**MS:** Arthralgia, myalgia, numbness, peripheral neuropathy
**RESP:** Cough, dyspnea, pneumonitis, pulmonary fibrosis/infiltrate
**SYST:** Stevens-Johnson syndrome, superinfection, SLE-like syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Readily absorbed |
| **Distribution** | Crosses placenta, excreted in breast milk |
| **Metabolism** | Liver, partially |
| **Excretion** | Kidneys, 30%-50% unchanged |
| **Half-life** | 20-60 min |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 30 min |
| **Duration** | 6-12 hr |

## INTERACTIONS

### Individual products

Magnesium trisilicate: decreased absorption
Norfloxacin: antagonist effect
Probenecid: increased nitrofurantoin levels

### Drug/lab test

Increased: BUN, alkaline phosphatase, bilirubin, creatinine, blood glucose

## NURSING CONSIDERATIONS

### Assessment

- Monitor blood count during chronic therapy
- Assess CNS symptoms: insomnia, vertigo, headache, drowsiness, seizures
- Assess allergy: fever, flushing, rash, urticaria, pruritus
- **Urinary tract infection:** assess for burning, pain on urination, fever; cloudy, foul-smelling urine; I&O ratio; C&S before treatment, after completion; serum creatinine, BUN
- **Hepatotoxicity:** assess for yellowing of skin, eyes, dark urine, clay-colored stools; monitor AST, ALT
- **Pulmonary fibrosis, pneumonitis:** assess for dyspnea, tachypnea, persistent cough
- **Serious skin disorders:** assess for fever, flushing, rash, urticaria, pruritus
- **Peripheral neuropathy:** assess for paresthesias (more common in diabetes mellitus, electrolyte imbalances, vit B deficiency, debilitated patients)
- **Pseudomembranous colitis:** assess for diarrhea, abdominal pain, fever, fatigue, anorexia; possible anemia, elevated WBC and low serum albumin; stop product and usually give either vancomycin or IV metroNIDAZOLE
- Pregnancy/breastfeeding: Do not use in 38-42 wk gestation and labor/delivery, cautious use in breastfeeding, excreted in breast milk
- **Beers:** Avoid in older adults, potential for pulmonary, hepatic toxicity, peripheral neuropathy

### Patient/family education

- Teach patient to take with food or milk; avoid alcohol
- Teach patient to protect susp from freezing and shake well before taking
- Teach patient that product may cause drowsiness; instruct client to seek aid in walking and other activities; advise patient not to drive or operate machinery while on medication
- Teach patient that diabetics should monitor blood glucose level
- Teach patient that product may turn urine rust-yellow to brown
- **Teach patient to notify prescriber of symptoms of pseudomembranous colitis:** fever,

diarrhea with mucous, pus, or blood; report immediately

### Evaluation

**Positive therapeutic outcome**
- Decreased dysuria, fever; negative C&S

**⚠ HIGH ALERT**

## nitroglycerin (Rx)
(nye-troe-gli'ser-in)
## Intravenous (Rx)
**Nitrojet 🍁, Nitronel**
## extended release caps (Rx)
**Nitrogard SR 🍁, Nitro-Time**
## translingual spray (Rx)
**Nitrolingual, Nitromist**
## sublingual (Rx)
**Nitrostat**
## rectal ointment
**Rectiv**
## topical ointment (Rx)
**Nitro-Bid, Nitrol 🍁, Rho-Nitro 🍁, Trinipatch 🍁**
## transdermal (Rx)
**Minitran, Nitro-Dur**

*Func. class.:* Coronary vasodilator, antianginal
*Chem. class.:* Nitrate

**ACTION:** Decreases preload and afterload, which thus decreases left ventricular end-diastolic pressure and systemic vascular resistance; dilates coronary arteries and improves blood flow through coronary vasculature, dilates arterial, venous beds systemically

**Therapeutic outcome:** Prevention of anginal attack

**USES:** Chronic stable angina pectoris, prophylaxis of angina pain, HF associated with acute MI, controlled hypotension in surgical procedures, anal fissures

## CONTRAINDICATIONS
Hypersensitivity to this product or nitrites, severe anemia, increased ICP, cerebral hemorrhage, closed-angle glaucoma, cardiac tamponade, cardiomyopathy, constrictive pericarditis

**Precautions:** Pregnancy, breastfeeding, children, postural hypotension, severe renal/hepatic disease, acute MI, abrupt discontinuation, hyperthyroidism

## DOSAGE AND ROUTES
**Adult: SL** dissolve tab under tongue when pain begins; may repeat q5min until relief occurs; take no more than 3 tab/15 min; use 1 tab prophylactically 5-10 min before activities; **SUS REL** cap q6-12hr on empty stomach; **TOP** 1-2 inches q8hr; increase to 4 in q4hr as needed; **IV** 5 mcg/min, then increase by 5 mcg/min q3-5min; if no response after 20 mcg/min, increase by 10-20 mcg/min until desired response; **transdermal** apply a patch daily to a site free from hair; remove patch at bedtime to provide 10-12 hr nitrate-free interval to avoid tolerance
**Child: IV** initial 0.25-0.5 mcg/kg/min, titrate to patient response, usual dose 1-3 mcg/kg/min transmucosal

### Anal fissures (Rectiv)
**Adult:** rectal apply 1 in of 0.4% ointment q12hr × 3 wk

**Available forms:** Translingual aerosol 0.4 mg/m spray; sus rel tabs 2.5, 6.5, 9 mg; SL tabs 0.3, 0.4, 0.6 mg; topical joint 2%; trans syst 0.1, 0.2, 0.3, 0.4, 0.6, 0.8 mg/hr; inj 25 mg/250 ml, 50 mg/250 ml, 100 mg/250 ml, 50 mg/500 ml, 100 mg/500 ml, 200 mg/500 ml; rectal ointment 0.4% (Rectiv)

### Implementation
**PO route**
- Swallow sus rel tabs whole; do not break, crush, or chew sus rel tabs
- Give 1 hr before or 2 hr after meals with 8 oz of water

**SL route**
- Should be dissolved under tongue or placed between gum and cheek, not swallowed

**Aerosol route**
- Sprayed under tongue (nitrolingual); not inhaled, prime before 1st-time use or if product has not been used in > 6 wk; press valve head with forefinger

**Transmucosal route**
- Tab should be placed between cheek and gum line
- Do not take anything PO when tab is in place

**Topical ointment route**
- Apply ointment using dose-measuring papers supplied; apply to an area without hair; ointment should cover 2-3–inch area; may apply an occlusive dressing as directed

**Transdermal route**
- Apply transdermal patches to area without hair; press hard to adhere; if patch becomes dislodged, apply a new one

**SL route**
- Keep tab in original container

• If 3 SL tab in 15 min do not relieve pain, consider diagnosis of MI
• SL tab should be held under tongue or between gum and cheek until dissolved (a few min); do not take anything by mouth when SL tab is in place

**Rectal route**

• Cover finger with plastic wrap, disposable glove or finger cot, lay finger alongside 1 inch dosing line on carton, squeeze tube until equal to 1 inch dosing line, insert covered finger no further than 1st finger joint gently into anal canal and on sides, wash hands thoroughly, if too painful, apply directly to outside of anus

**Continuous IV infusion route**

• Diluted in $D_5$, $D_5W$, 0.9% NaCl for inf to 200-400 mcg/ml depending on patient's fluid status, common dilution is 50 mg/250 ml, use controlled inf device; use glass inf bottles, non–polyvinyl chloride inf tubing; titrate to patient response; do not use filters

**Y-site compatibilities:** Acyclovir, alfentanil, amikacin, aminocaproic acid, aminophylline, amiodarone, amphotericin B lipid complex, amphotericin B liposome, anidulafungin, argatroban, ascorbic acid, atenolol, atracurium, atropine, azaTHIOprine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, cefamandole, cefAZolin, cefmetazole, cefonicid, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, cephalothin, cephapirin, chloramphenicol, chlorproMAZINE, cimetidine, cisatracurium, CISplatin, clindamycin, cloNIDine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, dexamethasone, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doxacurium, DOXOrubicin, doxycycline, drotrecogin alfa, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, epoetin alfa, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, folic acid, ganciclovir, gatifloxacin, gemcitabine, gemtuzumab, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, indomethacin, insulin (regular), irinotecan, isoproterenol, ketorolac, labetalol, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, meperidine, metaraminol, methicillin, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metroNIDAZOLE, mezlocillin, micafungin, miconazole, midazolam, milrinone, minocycline, mitoXANtrone, morphine, moxalactam, mycophenolate, nafcillin, nalbuphine, naloxone, nesiritide, netilmicin, niCARdipine, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, pantoprazole, papaverine, PEMEtrexed, penicillin G potassium/sodium, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, phytonadione, piperacillin, piperacillin-tazobactam, polymyxin B, potassium chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, pyridoxine, quiNIDine, quinupristin-dalfopristin, ranitidine, remifentanil, ritodrine, rocuronium, sodium bicarbonate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiopental, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, voriconazole, warfarin, zoledronic acid

**Y-site incompatibilities:** Alteplase

## ADVERSE EFFECTS

**CNS:** *Headache, flushing, dizziness*
**CV:** *Postural hypotension,* tachycardia, collapse, syncope, palpitations
**GI:** Nausea, vomiting
**INTEG:** Pallor, sweating, rash

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO, buccal, SL) |
| **Distribution** | Unknown |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidney |
| **Half-life** | 1-4 min |

### Pharmacodynamics

| | SUS REL | SL | TD | IV | TRANSMUCOSAL | AEROSOL | TOPICAL OINT |
|---|---|---|---|---|---|---|---|
| **Onset** | 20-45 min | 1-3 min | ½-1 hr | 1-2 min | 1-2 min | 2 min | ½-1 hr |
| **Peak** | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown |
| **Duration** | 3-8 hr | ½ hr | 12-24 hr | 3-5 min | 3-5 hr | ½-1 hr | 2-12 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased hypotension, CV collapse
Aspirin: increased nitrate level
Heparin: decreased effects (with IV nitroglycerin)
Avanafil, sildenafil, tadalafil, vardenafil: increased fatal hypotension, do not use together

### Drug classifications

Antihypertensives, β-adrenergic blockers, calcium channel blockers, diuretics: increased hypotension

### Drug/lab test

Increased: urine catecholamine, urine VMA
False increase: cholesterol

## NURSING CONSIDERATIONS

### Assessment

- Monitor orthostatic B/P, pulse
- **Assess pain:** duration, time started, activity being performed, character; check for tolerance if taken over long period
- Monitor for headache, light-headedness, decreased B/P; may indicate a need for decreased dosage
- **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding

### Patient/family education

- Instruct patient to avoid alcohol
- Advise patient that product may cause headache; tolerance usually develops; use nonopioid analgesic
- Teach patient that product may be taken before stressful activity, exercise, sexual activity
- Inform patient that SL tab may sting when product comes in contact with mucous membranes
- Caution patient to avoid hazardous activities if dizziness occurs
- Instruct patient to comply with complete medical regimen
- Advise patient to make position changes slowly to prevent fainting
- Advise patient to never use erectile dysfunction products (sildenafil, tadalafil, vardenafil); may cause severe hypotension, death

### Evaluation

**Positive therapeutic outcome**

- Decreased, prevention of anginal pain

**⚠ HIGH ALERT**

# nitroprusside (Rx)

(nye-troe-pruss'ide)
**Nitropress**
*Func. class.:* Antihypertensive, vasodilator

**ACTION:** Directly relaxes arteriolar, venous smooth muscle, resulting in reduction in cardiac preload, afterload

**Therapeutic outcome:** Decreased B/P in hypertensive crisis, decreased preload, afterload

**USES:** Hypertensive crisis/urgency/induction, to decrease bleeding by creating hypotension during surgery, acute HF

## CONTRAINDICATIONS

Hypersensitivity, hypertension (compensatory) due to aortic coarctation or AV shunting, acute HF associated with reduced peripheral vascular resistance, toxic amblyopia, hypothyroidism

**BLACK BOX WARNING:** Cyanide toxicity

**Precautions:** Pregnancy, breastfeeding, children, geriatric, fluid, electrolyte imbalances, renal/hepatic disease, hypothyroidism, anemia, increased intracranial pressure, hypovolemia

**BLACK BOX WARNING:** Hypotension

## DOSAGE AND ROUTES

**Adult and child: IV** INF 0.25-1.0 mcg/kg/min; max 10 mcg/kg/min

### Renal dose

**Adult:** IV INF CCr <60 ml/min maintain doses <3 mcg/kg/min to reduce thiocyanate accumulation

**Available forms:** Inj 50 mg 12 ml

### Implementation

**Continuous IV infusion route**

- Depending on B/P reading q15min
- Reconstitute 50 mg/2-3 ml of $D_5W$, further dilute in 250, 500, or 1000 ml of $D_5W$ to 200, 100, 50 mcg/ml respectively; use an infusion pump only; wrap bottle with aluminum foil to protect from light; observe for color change in the inf; discard if highly discolored (blue, green, dark red); titrate to patient response, protect from light
- Do not exceed max dose, cyanide may accumulate

**Y-site compatibilities:** Alfentanil, alprostadil, amikacin, aminocaproic acid, aminophylline, amphotericin B lipid complex, amphotericin B

liposome, anidulafungin, argatroban, atenolol, atropine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, cefamandole, ceFAZolin, cefmetazole, cefonicid, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, ceftAZidime, ceftizoxime, cefTRIAXone, cefuroxime, cephalothin, chloramphenicol, cimetidine, CISplatin, clindamycin, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, digoxin, diltiazem, DOCEtaxel, DOPamine, doxacurium, DOXOrubicin, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, epoetin alfa, eptifibatide, ertapenem, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, folic acid, furosemide, ganciclovir, gatifloxacin, gemcitabine, gemtuzumab, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, IDArubicin, ifosfamide, inamrinone, indomethacin, insulin (regular), isoproterenol, ketorolac, labetalol, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, meperidine, metaraminol, methicillin, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, mezlocillin, micafungin, miconazole, midazolam, milrinone, minocycline, morphine, moxalactam, multiple vitamins injection, nafcillin, nalbuphine, naloxone, nesiritide, netilmicin, niCARdipine, nitroglycerin, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, pantoprazole, penicillin G potassium/sodium, pentamidine, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, phytonadione, piperacillin, piperacillin-tazobactam, polymyxin B, potassium chloride/phosphates, procainamide, propofol, propranolol, protamine, pyridoxine, ranitidine, ritodrine, rocuronium, sodium acetate/bicarbonate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, zoledronic acid

## ADVERSE EFFECTS

**CNS:** *Dizziness, headache,* agitation, twitching, decreased reflexes, *restlessness*
**CV:** *Bradycardia,* ECG changes, tachycardia, *hypotension*
**GI:** Nausea, vomiting, abdominal pain
**INTEG:** Pain, irritation at inj site, sweating
**MISC:** Cyanide, thiocyanate toxicity, flushing, hypothyroidism

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete bioavailability |
| **Distribution** | Not known |
| **Metabolism** | RBCs, tissues |
| **Excretion** | Kidneys |
| **Half-life** | 2 min |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 1-2 min |
| **Peak** | Rapid |
| **Duration** | 1-10 min |

## INTERACTIONS

### Individual drugs

Enflurane, halothane; severe hypotension

### Drug classifications

Circulatory depressants, ganglionic blockers, volatile liquid anesthetics: severe hypotension

### Drug/herb

Hawthorn: increased antihypertensive effect

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Hypotension:** monitor B/P q5min × 2 hr, then qhr × 2 hr; monitor pulse q4hr; monitor jugular venous distention q4hr; ECG should be monitored continuously; monitor PCWP; rebound hypertension may occur after nitroprusside is discontinued, give only with emergency equipment nearby, rapid decrease in B/P may occur

- Monitor electrolytes, blood studies: potassium, sodium, chloride, $CO_2$, CBC, serum glucose, serum methemoglobin if pulmonary oxygen levels are decreased, ABGs
- Check weight, I&O, edema in feet and legs daily; assess skin turgor, dryness of mucous membranes for hydration status
- Assess for signs of HF: dyspnea, edema, wet crackles
- Monitor for increased lactate, cyanide, thiocyanate levels if on long-term treatment; thiocyanate toxicity occurs at plasma levels of ≥50 mcg/ml
- Monitor for decrease in bicarbonate, $PaCO_2$, and blood pH; acidosis may occur with this product
- **Pregnancy/breastfeeding:** Prolonged use may result in fetal death (cyanide toxicity), do not breastfeed

### Patient/family education

- Teach patient to report headache, dizziness, loss of hearing, blurred vision, dyspnea, faintness; may indicate adverse reactions, pain at IV site

### Evaluation

**Positive therapeutic outcome**
- Decreased B/P in hypertension
- Absence of bleeding in surgery

## TREATMENT OF OVERDOSE:
Administer amyl nitrate inh until 3% sodium nitrate sol can be prepared for **IV** administration, then inject sodium thiosulfate **IV;** correct drop in B/P with vasopressor

**⚠ HIGH ALERT**

**RARELY USED**

## nivolumab
(nye-volue-mab)
**Opdivo**
*Func. class.:* Antineoplastic, monoclonal antibody

## USES:
Treatment of BRAF V600 mutation–positive unresectable/metastatic melanoma, Hodgkin's disease, non–small-cell lung cancer (NSCLC), renal cell cancer

## CONTRAINDICATIONS
Hypersensitivity

## DOSAGE AND ROUTES
**Adult: IV** INF 240 mg over 60 min q2wk until disease progression or unacceptable toxicity

**Available forms:** Injection 10 mg/ml

**⚠ HIGH ALERT**

## norepinephrine
(nor-ep-i-nef'rin)
**Levophed**
*Func. class.:* Adrenergic
*Chem. class.:* Catecholamine

**Do not confuse:** norepinephrine/EPINEPHrine

## ACTION:
Causes increased contractility and heart rate by acting on β-receptors in heart; also acts on a-receptors, thereby causing vasoconstriction in blood vessels; B/P is elevated, coronary blood flow improves, and cardiac output increases

**Therapeutic outcome:** Increased B/P with stabilization; adequate tissue perfusion

## USES:
Acute hypotension, shock

## CONTRAINDICATIONS
Hypersensitivity to this product or cyclopropane/halothane anesthesia; ventricular fibrillation, tachydysrhythmias, hypovolemia

**BLACK BOX WARNING:** Extravasation

**Precautions:** Pregnancy, breastfeeding, geriatric patients, arterial embolism, peripheral vascular disease, hypertension, hyperthyroidism, cardiac disease, ventricular fibrillation, tachydysrhythmias, pheochromocytoma, hypotension

## DOSAGE AND ROUTES
**Adult: IV INF** 0.5-1 mcg/min titrated to B/P; maintenance 2-4 mcg/min; max 30 mcg/min
**Child: IV INF** 0.1 mcg/kg/min titrated to B/P; max 2 mcg/kg/min

**Available forms:** Inj 1 mg/ml

### Implementation
- Plasma expanders for hypervolemia, correct volume depletion before starting treatment

**CONT IV INF route**
- Dilute with 500-1000 ml $D_5W$ or $D_5$/0.9% NaCl; average dilution 4 mg/1000 ml diluent (4 mcg base/ml); give as inf 2-3 ml/min; titrate to response, discontinue gradually
- Store reconstituted sol in refrigerator <24 hr, protect from light, store unopened product at room temp, do not use discolored sol

**Y-site compatibilities:** Alemtuzumab, alfentanil, amikacin, amiodarone, anidulafungin, argatroban, ascorbic acid, atenolol, atracurium, atropine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, cefamandole, ceFAZolin, cefmetazole, cefonicid, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, ceftobiprole, cefTRIAXone, cefuroxime, cephalothin, chloramphenicol, chlorproMAZINE, cimetidine, cisatracurium, CISplatin, clindamycin, cloNIDine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DAPTOmycin, dexamethasone, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doripenem, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, epoetin alfa, ertapenem, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, irinotecan, isoproterenol, ketorolac, labetalol, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, meperidine, meropenem, metaraminol, methicillin, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, mezlocillin, micafungin, miconazole,

midazolam, milrinone, minocycline, mitoXANtrone, morphine, moxalactam, multiple vitamins injection, mycophenolate, nafcillin, nalbuphine, naloxone, netilmicin, niCARdipine, nitroglycerin, nitroprusside, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, papaverine, PEMEtrexed, penicillin G potassium/sodium, pentamidine, pentazocine, phenylephrine, phytonadione, piperacillin, piperacillin-tazobactam, polymyxin B, potassium chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, pyridoxine, quiNIDine, ranitidine, remifentanil, ritodrine, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, vitamin B complex with C, voriconazole, zoledronic acid

## ADVERSE EFFECTS

**CNS:** *Headache,* anxiety, dizziness, insomnia, restlessness, tremor, cerebral hemorrhage
**CV:** *Palpitations, tachycardia, hypertension, ectopic beats, angina*
**GI:** *Nausea, vomiting*
**GU:** Decreased urine output
**INTEG:** Necrosis, tissue sloughing with extravasation, gangrene
**RESP:** Dyspnea
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete |
| **Distribution** | Crosses placenta |
| **Metabolism** | Liver |
| **Excretion** | Urine |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Immediate |
| **Peak** | Rapid |
| **Duration** | 1 min |

## INTERACTIONS

### Individual drugs

- **Methyldopa:** do not use norepinephrine within 2 wk of using these drugs because hypertensive crisis may result

### Drug classifications

α-blockers: decreased norepinephrine action
- **Antihistamines, ergots, MAOIs, oxytocics, tricyclics:** do not use norepinephrine within 2 wk of using these drugs because hypertensive crisis may result

Oxytocics: Increased B/P
MAOIs, tricyclics: increased pressor effect

## NURSING CONSIDERATIONS

### Assessment

- Assess I&O ratio; notify prescriber if output <30 ml/hr
- Assess B/P, pulse q2-3min after parenteral route, ECG during administration continuously; if B/P increases, product is decreased, CVP or PWP during inf if possible
- Assess paresthesias and coldness of extremities; peripheral blood flow may decrease

**BLACK BOX WARNING: Extravasation:** inj site: tissue sloughing, change injection sites if blanching or vasoconstriction occurs

- Assess for sulfite sensitivity, which may be life-threatening
- **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding

### Patient/family education

- Teach patient about the reason for product administration
- Advise family to report dyspnea, dizziness, chest pain

### Evaluation

**Positive therapeutic outcome**
- Increased B/P with stabilization
- Adequate tissue perfusion

## TREATMENT OF OVERDOSE:

Administer fluids, electrolyte replacement

## nortriptyline (Rx)

(nor-trip'ti-leen)
**Aventyl, Pamelor**
*Func. class.:* Antidepressant, tricyclic
*Chem. class.:* Dibenzocycloheptene, secondary amine

**Do not confuse:** nortriptyline/amitriptyline Pamelor/Panlor DC/Tambocor

**ACTION:** Blocks reuptake of norepinephrine, serotonin into nerve endings, increasing action of norepinephrine, serotonin in nerve cells; has anticholinergic effects

**Therapeutic outcome:** Decreased symptoms of depression after 2-3 wk

**USES:** Major depression

**Unlabeled uses:** Chronic pain management

## CONTRAINDICATIONS

Hypersensitivity to tricyclics, carBAMazepine, recovery phase of MI

**Precautions:** Breastfeeding, suicidal ideation, severe depression, increased intraocular

pressure, closed-angle glaucoma, urinary retention, cardiac/hepatic disease, hyperthyroidism, electroshock therapy, elective surgery, pregnancy, seizure disorders, prostatic hypertrophy

**BLACK BOX WARNING:** Children, suicidal ideation

## DOSAGE AND ROUTES

**Adult:** PO 25 mg tid or qid; may increase to 150 mg/day; may give daily dose at bedtime
**Adolescent:** PO 1-3 mg/kg/day in 3-4 divided doses or qd at bedtime; max 150 mg/day
**Geriatric:** PO 10-25 mg nightly, increase by 10-25 mg at weekly intervals to desired dose; usual maintenance 75 mg/day, max 150 mg/day

**Available forms:** Caps 10, 25, 50, 75 mg; sol 10 mg/5 ml

### Implementation

- Give with food or milk to decrease GI symptoms; mix conc with water, milk, fruit juice to disguise taste
- Give dose at bedtime if oversedation occurs during day; may take entire dose at bedtime; geriatric may not tolerate once/day dosing
- Store in tight, light-resistant container at room temp; do not freeze

## ADVERSE EFFECTS

**CNS:** *Dizziness, drowsiness,* confusion, headache, anxiety, tremors, stimulation, weakness, insomnia, nightmares, EPS (geriatric), increased psychiatric symptoms, seizures
**CV:** *Orthostatic hypotension,* ECG changes, *tachycardia,* hypertension, palpitations, dysrhythmias
**EENT:** Blurred vision, tinnitus, mydriasis, dry eyes
**ENDO:** SIADH, hyponatremia, hypothyroidism
**GI:** *Constipation, dry mouth,* nausea, vomiting, paralytic ileus, increased appetite, cramps, epigastric distress, jaundice, hepatitis, stomatitis, weight gain
**GU:** *Retention,* acute renal failure, sexual dysfunction
**HEMA:** Agranulocytosis, thrombocytopenia, eosinophilia, leukopenia
**INTEG:** Rash, urticaria, sweating, pruritus, photosensitivity
**SYST:** Serotonin syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Liver, extensively CYP2D6 by genetic polymorphism (≥ 7% are poor metabolizers) |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 18-28 hr; steady state 4-19 days |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
CloNIDine, guanethidine: decreased effects
Smoking (heavy): decreased product effect
Haloperidol, chloroquine, droperidol, pentamidine, arsenic trioxide, levomethadyl: increased QT prolongation

### Drug classifications

Barbiturates, benzodiazepines, CNS depressants: increased effects
MAOIs: hypertensive episode, hyperpyretic crisis, seizures
SSRIs, SNRIs, serotonin-receptor agonists: increased serotonin syndrome, neuroleptic malignant syndrome
Class IA/III antidysrhythmics, some phenothiazines, β-agonists, local anesthetics, tricyclics, CYP3A4 inhibitors (amiodarone, clarithromycin, erythromycin, telithromycin, troleandomycin), CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone): increased QT prolongation
Sympathomimetics (direct-acting), products increasing QT interval: increased effects
Sympathomimetics (indirect-acting): decreased effects

### Drug/herb

Kava, valerian: increased CNS effect
St. John's wort: decreased nortriptyline level

### Drug/lab test

Increased: serum bilirubin, blood glucose, alkaline phosphatase
Decreased: VMA, 5-HIAA
False increase: urinary catecholamines

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Suicidal thoughts/behaviors in children/young adults:** not approved for children; monitor for suicidal ideation in depression, adolescents, young adults

- Monitor B/P (with patient lying, standing), pulse q4hr; if systolic B/P drops 20 mm Hg, hold product, notify prescriber; take VS q4hr of patients with CV disease
- Monitor blood studies: thyroid function tests, LFTs, serum nortriptyline level/target 50-150 ng/ml if patient is receiving long-term therapy
- Monitor liver function tests: AST, ALT, bilirubin
- Check weight weekly; appetite may increase
- **QT prolongation:** assess for chest pain, palpitations, dyspnea
- Assess ECG for flattening of T-wave, bundle branch block, AV block, dysrhythmias in cardiac patients
- Assess for EPS primarily in geriatric: rigidity, dystonia, akathisia
- Assess mental status: mood, sensorium, affect, suicidal tendencies; increase in psychiatric symptoms: depression, panic
- Monitor urinary retention, constipation; constipation is more likely to occur in children or geriatric
- **Assess for withdrawal symptoms:** headache, nausea, vomiting, muscle pain, weakness; do not usually occur unless product was discontinued abruptly
- Monitor for glaucoma exacerbation and paralytic ileus
- Identify alcohol consumption; if alcohol is consumed, hold dose until AM
- **Serotonin syndrome, neuroleptic malignant syndrome:** assess for increased heart rate, shivering, sweating, dilated pupils, tremors, high B/P, hyperthermia, headache, confusion; if these occur, stop product, administer a serotonin antagonist if needed (rare)
- **Beers:** Avoid in older adults, highly anticholinergic, sedating, and causes orthostatic hypotension

### Patient/family education

- Teach patient that therapeutic effects may take 2-3 wk
- Teach patient to use caution in driving and other activities requiring alertness because of drowsiness, dizziness, blurred vision; to avoid rising quickly from sitting to standing, especially geriatric
- Teach patient to avoid alcohol ingestion, MAOIs within 14 days, other CNS depressants; teach patient not to discontinue medication quickly after long-term use; may cause nausea, headache, malaise
- Teach patient to wear sunscreen or large hat to avoid burns, because photosensitivity occurs
- Teach patient to increase fluids, bulk in diet if constipation, urinary retention occur, especially geriatric, worsening depression, suicidal thoughts/behavior
- Teach patient to take gum, hard sugarless candy, or frequent sips of water for dry mouth
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Decrease in depression
- Absence of suicidal thoughts

## TREATMENT OF OVERDOSE:

ECG monitoring, lavage, administer anticonvulsant

## nystatin (Rx, OTC)

(nis' ta-tin)

**Mycostatin, Nadostine, Nilstat, Pedi-Dri, PMS-Nystatin**

*Func. class.:* Antifungal

*Chem. class.:* Amphoteric polyene

**ACTION:** Interferes with fungal DNA replication; binds sterols in fungal cell membrane, which increases permeability, resulting in leaking of cell nutrients

**Therapeutic outcome:** Fungistatic/fungicidal against *Candida* organisms

**USES:** *Candida* species causing oral, intestinal infections

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy

## DOSAGE AND ROUTES

### Oral infection

**Adult/adolescent/child:** SUSP 400,000-600,000 units qid, use ½ dose in each side of mouth, swish and swallow, use for at least 48 hr after symptoms are resolved

**Infant:** SUSP 200,000 units qid (100,000 units in each side of mouth)

**Newborn and premature infant:** SUSP 100,000 units qid

**Adult and child:** Troches 200,000-400,000 units qid × up to 2 wk

### GI infection
**Adult:** PO 500,000-1,000,000 units tid

### Cutaneous candidiasis
**Adult/child:**
**Top cream/ointment**
Apply to affected area bid
**Powder**
Apply to affected area bid-tid

**Available forms:** Tabs 500,000 units; oral caps 500,000, 1,000,000 units, bulk powder; susp 1,000,000 unit/ml

### Implementation
• Store oral susp at room temp; store tabs in tight, light-resistant containers at room temp
**PO route**
• Give oral susp dose by placing ½ in each cheek, swish for several min, then swallow; shake susp before use
• Store oral susp at room temp, tab in airtight, light-resistant containers at room temp
**Topical route**
• Administer by moistening lesions with a swab coated with cream or ointment; use enough medication to cover lesions completely; give after cleansing with soap, water before each application; dry well; very moist lesions are best treated with topical powder

## ADVERSE EFFECTS
**GI:** Nausea, vomiting, anorexia, diarrhea, cramps
**INTEG:** Rash, urticaria (rare)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Poorly absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Not metabolized |
| **Excretion** | Feces, unchanged |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | Unknown |
| **Duration** | 6-12 hr |

## NURSING CONSIDERATIONS
### Assessment
• **Assess for allergic reaction:** rash, urticaria; product may have to be discontinued
• Assess for predisposing factors for candidal infection: antibiotic therapy, pregnancy, diabetes mellitus, sexual partner infection (vag infections), AIDS
• Obtain culture and histologic tests to confirm organism
• **Pregnancy/breastfeeding:** Use only if clearly needed, may breastfeed

### Patient/family education
• Instruct patient that long-term therapy may be needed to clear infection; to complete entire course of medication
• Teach patient proper hygiene: use no commercial mouthwashes for mouth infection
• Advise patient to avoid getting preparation on hands
• Instruct patient to notify prescriber if irritation occurs; product may have to be discontinued
• Inform patient that relief from itching may occur after 24-72 hr
**Topical route**
• Advise patient to discontinue use and notify prescriber if irritation occurs
• Teach patient to apply with glove to prevent further infection; product may stain
• Caution patient not to use occlusive dressings; to avoid use of OTC creams, ointments, lotions unless directed by prescriber

### Evaluation
**Positive therapeutic outcome**
• Culture negative for *Candida*
• Decrease in size, number of lesions

**nystatin topical**
*See Appendix B*

nadolol (Rx)
naloxone (Rx)
naratriptan (Rx)
nebivolol/valsartan
nevirapine (Rx)
niCARdipine (Rx)
nicotine chewing gum
nicotine nasal spray (Rx)
nilotinib (Rx)
nitroglycerin (Rx)
translingual spray (Rx)
topical ointment (Rx)
nivolumab
nystatin (Rx, OTC)
nafcillin (Rx)
naphazoline ophthalmic
natamycin ophthalmic
nelfinavir (Rx)
niacin (Rx, OTC)
nicotinamide
nicotine inhaler (OTC, Rx)
nicotine transdermal (OTC, Rx)
niMODipine (Rx)
Intravenous (Rx)
sublingual (Rx)
transdermal (Rx)
norepinephrine
nystatin topical
nalbuphine (Rx)
naproxen
nebivolol (Rx)
nepafenac ophthalmic
niacinamide (Rx, OTC)
nicotine
nicotine lozenge (OTC)
NIFEdipine (Rx)
nitrofurantoin (Rx)
extended release caps (Rx)
rectal ointment
nitroprusside (Rx)
nortriptyline (Rx)

**⚠ HIGH ALERT**

## obinutuzumab

(oh'bi-nue-tooz'ue-mab)

**Gazyva**

*Func. class.:* Antineoplastic

*Chem. class.:* Biologic response modifier, monoclonal antibody

**ACTION:** A recombinant human monoclonal antibody that binds to the gastric B-lymphocyte–associated antibody, action is indirect, possible through T-cell–mediated anti-tumor responses

**Therapeutic outcome:** Decreased disease progression

**USES:** Chronic lymphocytic leukemia, non-Hodgkin's lymphoma (follicular lymphoma) in relapse or refractory to riTUXimab-containing regimen, used in combination

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, cardiac disease, children, human antichimeric antibody (HACA), human antimurine antibody (HAMA), infection, infusion-related reactions, neutropenia, pulmonary disease, thrombocytopenia, tumor lysis syndrome, vaccination

**BLACK BOX WARNING:** Hepatitis B exacerbation, progressive multifocal leukoencephalopathy

## DOSAGE AND ROUTES

**Available forms:** Sol for inj 1000 mg/40 ml

### Implementation

**IV intermittent infusion route**

- Due to the risk of hypotension, consider withholding antihypertensive medications for 12 hr before, during, and for the 1st hr after use until B/P is stable
- Give antimicrobial prophylaxis to neutropenic patients throughout treatment; consider antiviral and antifungal prophylaxis as needed
- **Premedication for cycle 1, days 1 and 2:** acetaminophen 650-1000 mg, and diphenhydrAMINE 50 mg at least 30 min prior to infusion, dexamethasone 20 mg IV or methylPREDNISolone 80 mg IV at least 1 hr before infusion
- **Premedication for cycle 1, days 8 and 15 and cycles 2-6, day 1:** acetaminophen 650-1000 mg at least 30 min prior to the infusion; those with any infusion-related reaction with the previous infusion should also receive diphenhydrAMINE 50 mg at least 30 min before the infusion; if the patient had a grade 3 infusion-related reaction with the previous dose or has a lymphocyte count $> 25 \times 10^9$/L, additionally administer dexamethasone 20 mg IV or methylPREDNISolone 80 mg IV at least 1 hr before infusion
- Use in a facility to adequately monitor and treat infusion reactions
- Visually inspect parenteral products for particulate matter and discoloration prior to use
- Prepare all doses in 0.9% NaCl; do not admix; use a final concentration of 0.4-4 mg/ml; give as an IV infusion only

**Reconstitution**

**Cycle 1, day 1 and 2**

- Withdraw 4 ml (100 mg) from the vial and dilute into 100 ml 0.9% NaCl; use on day 1; mix by gentle inversion; do not shake, use immediately
- Withdraw the remaining 36 ml (900 mg) and dilute into 250 ml 0.9% NaCl for use on day 2; mix by gentle inversion; do not shake

**Cycle 1, day 8 and 15; cycles 2-6**

- Withdraw 40 ml (1000 mg) from the vial and dilute into 250 ml 0.9% NaCl mix by gentle inversion; do not shake.
- Storage following reconstitution: Store at 2-8 °C (36-46 °F) for up to 24 hr. Do not freeze. Allow to come to room temperature before administration, use a dedicated line.
- **Day 1 (100-mg dose):** Give at an initial rate of 25 mg/hr over 4 hr. Do not increase the infusion rate.
- **Day 2 (900-mg dose):** Give at an initial rate of 50 mg/hr × 30 min; if no hypersensitivity or infusion-related events occur, increase the infusion rate by 50 mg/hr q30min to a max rate of 400 mg/hr. If a grade 1-2 infusion-related reaction occurs, the infusion should be temporarily interrupted or the rate reduced. The infusion may be resumed or continued at a reduced rate upon improvement of the patient's symptoms; if the reaction does not recur, the rate may be increased as appropriate for the current cycle and dose. If a grade 3 hypersensitivity or infusion-related event develops, the infusion should be temporarily interrupted. Upon improvement of the patient's symptoms, the infusion can be resumed at half the rate being used at the time that the reaction occurred; if the reaction does not recur, the rate may be increased as appropriate for the current cycle and dose. If a grade 4 hypersensitivity or infusion-related event develops, discontinue the infusion and do not resume.

• **Subsequent infusions (1000-mg dose):** Give at an initial rate of 100 mg/hr for 30 min; if no hypersensitivity or infusion-related events occur, increase the infusion rate by 100 mg/hr q30min to a max rate of 400 mg/hr; if a grade 1-2 infusion-related reaction occurs, the infusion should be temporarily interrupted or the rate reduced. The infusion may be resumed or continued at a reduced rate upon improvement of the patient's symptoms; if the reaction does not recur, the rate may be increased as appropriate for the current cycle and dose. If a grade 3 hypersensitivity or infusion-related event develops, the infusion should be temporarily interrupted. Upon improvement of the patient's symptoms, the infusion can be resumed at half the rate being used at the time that the reaction occurred; if the reaction does not recur, the rate may be increased as appropriate for the current cycle and dose. If a grade 4 hypersensitivity or infusion-related event develops, discontinue the infusion and do not resume.

## ADVERSE EFFECTS

**CNS:** Headache, *fever*, chills, flushing
**CV:** Cardiac arrest, MI, sinus tachycardia, hypertension
**GI:** Constipation, decreased appetite, diarrhea, hepatitis/hepatic failure nausea, vomiting
**HEMA:** *Neutropenia, thrombocytopenia, lymphopenia, leukopenia, anemia*
**META:** Lower *potassium*/sodium/calcium, aluminum, higher potassium/uric acid
**RESP:** Wheezing, dyspnea, cough
**SYST:** Tumor lysis syndrome, infection
**MISC:** Arthralgia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Terminal half-life 28.4 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

### Drug/lab

Increase: LFTs

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** HEPATITIS B: reactivation of HBV in those who are HBsAg positive, HBsAg negative, and core antibody anti-HBc positive; may result in fulminant hepatitis, hepatic failure, and death, screen high-risk patients before use, monitor carriers for active HBV infection during and for several months after therapy completion, discontinue treatment of any other antineoplastics if infection is reactivated

• **Bone marrow suppression:** Monitor CBC with differential before infusion and regularly, platelets
• **Infection:** Assess for signs of infection, provide neutropenia precaution

**BLACK BOX WARNING:** **Progressive multifocal leukoencephalopathy (PML):** Notify prescriber of any new or worsening neurologic signs/symptoms (ataxia, visual changes, confusion)

• **Tumor lysis syndrome:** Can occur within 24 hr of 1st infusion, those with high tumor burden or lymphocyte count $>25\times10^9$/L are at increased risk; monitor serum creatinine, potassium, calcium, uric acid, phosphate closely

**BLACK BOX WARNING:** Severe/life-threatening infusion reactions: 2/3 of patients have a reaction to 1st dose; consider withholding antihypertensives for 12 hr prior to, during, and after 1st hr of infusion

• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed, excretion unknown

### Patient/family education

• Teach patient about the reason for treatment and expected results

**BLACK BOX WARNING:** Hepatitis B: To report yellow skin, eyes, fatigue, dark urine, that continuing follow-up will be needed

**BLACK BOX WARNING:** Progressive multifocal leukoencephalopathy (PML): To report confusion, visual changes, dizziness, difficulty walking or talking

• Teach patient to avoid live virus vaccines, vaccinations should be brought up to date before use

### Evaluation
**Positive therapeutic outcome**
- Decreased disease progression

## octreotide (Rx)
(ok-tree'o-tide)
**SandoSTATIN, Sandostatin LAR Depot**
*Func. class.:* Growth hormone, antidiarrheal
*Chem. class.:* Synthetic analog of somatostatin

**Do not confuse:** SandoSTATIN/SandIMMUNE

**ACTION:** A potent growth hormone similar to somatostatin

**Therapeutic outcome:** Decreased diarrhea; decreased symptoms of acromegaly, carcinoid tumors, vasoactive intestinal peptide tumors (VIPomas)

**USES:** **Sandostatin:** acromegaly, carcinoid tumors, VIPomas; **LAR Depot:** long-term maintenance of acromegaly, carcinoid tumors, VIPomas, short bowel syndrome, insulinoma, hepatorenal syndrome

**Unlabeled uses:** GI fistula, variceal bleeding, diarrheal conditions, pancreatic fistula, IBS, dumping syndrome

## CONTRAINDICATIONS
Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, geriatric, diabetes mellitus, hypothyroidism, renal disease

## DOSAGE AND ROUTES
### Acromegaly
**Adult:** SUBCUT/**IV** 50-100 mcg bid-tid, adjust q2wk based on growth hormone levels (Sandostatin) or IM 20 mg q4wk × 3 mo, adjust by growth hormone levels (Sandostatin LAR)

### VIPomas
**Adult:** SUBCUT/**IV** 200-300 mcg/day in 2-4 doses for 2 wk, max 450 mcg/day; (Sandostatin) or IM 20 mg q2wk × 2 mo, adjust dose (Sandostatin LAR)

### Flushing/diarrhea in carcinoid tumors
**Adult:** SUBCUT/**IV** 100-600 mcg/day in 2-4 doses for 2 wk, titrated to patient response (Sandostatin) or IM 20 mg q4wk × 2 mo, adjust dose (Sandostatin LAR)

### GI fistula
**Adult:** SUBCUT 50-200 mcg q8hr

### Antidiarrheal in AIDS patients (unlabeled)
**Adult:** SUBCUT 50 mcg q8h PRN, increase to 500 mcg q8h

### Irritable bowel syndrome (unlabeled)
**Adult:** SUBCUT 100 mcg single dose to 125 mcg bid

### Dumping syndrome (unlabeled)
**Adult:** SUBCUT 50-150 mcg/day

### Variceal bleeding (unlabeled)
**Adult:** **IV** 25-50 mcg/hr CONT **IV** INF for 18 hr-5 days

**Available forms:** Sandostatin: inj 0.05, 0.1, 0.2, 0.5, 1 mg/ml; LAR Depot: inj powder for susp 10 mg, 20, 30 mg/5 ml

### Implementation
- Store in refrigerator for unopened amps, vials, or at room temp for 2 wk; protect from light; do not use discolored or cloudy sol
- Do not use if discolored or if particulates are present

**IM route**
- Reconstitute with diluent provided; give into gluteal, rotate injection sites

**SUBCUT route**
- Rotate inj sites; use hip, thigh, abdomen
- Avoid using medication that is cold; allow to reach room temperature; do not use LAR Depot, do not use if discolored or if particulates are present

**Direct IV route**
- Give over 3 min; in an emergency carcinoid crisis, give rapid bolus

**Intermittent IV INF route**
- Dilute in 50-200 ml $D_5W$, 0.9% NaCl; give over 15-30 min
- Solution is stable for 24 hr

**Y-site compatibilities:** Acyclovir, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amiodarone, amphotericin B colloidal, amphotericin B lipid complex, amphotericin B liposome, ampicillin, ampicillin-sulbactam, anidulafungin, argatroban, arsenic trioxide, atenolol, atracurium, azithromycin, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, busulfan, butorphanol, calcium chloride/gluconate, capreomycin, CARBOplatin, carmustine, caspofungin, ceFAZolin, cefepime, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, cyclophosphamide, cycloSPORINE, cytarabine,

dacarbazine, DACTINomycin, DAPTOmycin, DAUNOrubicin, DAUNOrubicin liposome, dexamethasone, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, DOXOrubicin, DOXOrubicin liposomal, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, foscarnet, fosphenytoin, furosemide, gallium nitrate, ganciclovir, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, haloperidol, heparin, hydrALAZINE, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, insulin (regular), irinotecan, isoproterenol, ketorolac, labetalol, lansoprazole, leucovorin, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, meropenem, mesna, methohexital, methotrexate, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, minocycline, mitoMYcin, mitoXANtrone, mivacurium, morphine, moxifloxacin, mycophenolate, nafcillin, nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, ondansetron, oxaliplatin, PACLitaxel, palonosetron, pamidronate, pancuronium, PEMEtrexed, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phenylephrine, piperacillin, piperacillin-tazobactam, polymyxin B, potassium acetate/chloride/phosphates, procainamide, prochlorperazine, promethazine, propranolol, quiNIDine, quinupristin-dalfopristin, ranitidine, remifentanil, rocuronium, sodium acetate/bicarbonate/phosphates, streptozocin, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, tacrolimus, teniposide, thiopental, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, topotecan, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness, fatigue, weakness,* depression, anxiety, tremors, seizures, paranoia

**CV:** *Sinus bradycardia, conduction abnormalities,* dysrhythmias, chest pain, shortness of breath, thrombophlebitis, ischemia, HF, hypertension, palpitations, QT prolongation, ST-T wave changes

**ENDO:** *Hypo/hyperglycemia, ketosis, hypothyroidism,* galactorrhea, diabetes insipidus

**GI:** *Diarrhea, nausea, abdominal pain, vomiting, flatulence, distension, constipation,* hepatitis, elevated liver function tests, GI bleeding, pancreatitis, cholelithiasis, ileus

**GU:** UTI

**HEMA:** Hematoma of inj site, bruise

**INTEG:** Rash, urticaria, pain, inflammation at inj site

**MS:** Joint and muscle pain

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly, completely absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Little |
| **Excretion** | Urine, unchanged |
| **Half-life** | 1.7 hr |

### Pharmacodynamics

| | Subcut/IV | IM |
|---|---|---|
| **Onset** | Unknown | Unknown |
| **Peak** | ½ hr | 2-4 wk |
| **Duration** | 12 hr | Unknown |

## INTERACTIONS

### Individual drugs

Bromocriptine: decreased: effect of bromocriptine

CycloSPORINE: decreased effect of cycloSPORINE

Haloperidol, chloroquine, droperidol, pentamidine, arsenic trioxide, levomethadyl: increased QT prolongation

### Drug classifications

Class IA/III antidysrhythmics, some phenothiazines, β-agonists, local anesthetics, tricyclics, CYP3A4 inhibitors (amiodarone, clarithromycin, erythromycin, telithromycin, troleandomycin), CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone): increased QT prolongation

Oral antidiabetics: decreased: effect of the oral antidiabetics; monitor blood glucose

CYP3A4 metabolized products: decreased: excretion of these products; reduction of dose may be required

### Drug/food

Decreased: absorption of dietary fat, vit $B_{12}$ levels

### Drug/lab test

Increased: glucose

Decreased: $T_4$, thyroid function tests, vit $B_{12}$, glucose

## NURSING CONSIDERATIONS

### Assessment

- Identify growth hormone antibodies, IGF-1, 1-4 hr intervals for 8-12 hr after dose in acromegaly; 5-HIAA; blood glucose, serotonin levels

(carcinoid tumors), plasma substance P, plasma vasoactive intestinal peptide (VIP) (VIPomas)
• Monitor for fecal fat, serum carotene, somatomedin-C q14 days, glucose; plasma serotonin levels (carcinoid tumors); plasma vasoactive intestinal peptide levels (VIPoma); serum growth hormone, serum IGF-1 baseline and periodically, diabetes to monitor blood glucose
• Monitor thyroid function tests: $T_3$, $T_4$, $T_7$, TSH to identify hypothyroidism
• Assess for allergic reaction: rash, itching, fever, nausea, wheezing
• **Assess for cardiac status:** bradycardia, conduction abnormalities, dysrhythmias; monitor ECG for QT prolongation, low voltage, axis shifts, early repolarization, R/S transition, early wave progression
• **Allergic reaction:** assess for rash, itching, fever, nausea, wheezing
• Gallbladder disease, pancreatitis: monitor closely
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excreted in breast milk
• **Ileus:** Assess character of stools, baseline and throughout treatment

### Patient/family education
• Explain reason for medication and expected results
• Advise patient that routine follow-up is needed
• Instruct parents on procedure for medication preparation and inj use; request demonstration, return demonstration; provide written instructions
• Advise patient that dizziness, drowsiness, weakness may occur; to avoid hazardous activities if these occur; to report abdominal pain immediately
• Teach patient that pregnancy may occur in acromegaly since fertility may be restored
• Teach diabetic patients to monitor glucose regularly

### Evaluation
**Positive therapeutic outcome**
• Decreased symptoms of acromegaly, carcinoid, VIPoma
• Decreased diarrhea in AIDS

## ofloxacin ophthalmic
*See Appendix B*

## OLANZapine (Rx)
(oh-lanz′a-peen)
**ZyPREXA, Zyprexa Intramuscular, Zyprexa Relprevv, Zyprexa Zydis**
*Func. class.:* Antipsychotic (first generation)/neuroleptic
*Chem. class.:* Thienobenzodiazepine

**Do not confuse:** OLANZapine/olsalazine, Zyprexa/Celexa/Zyrtec

**ACTION:** May mediate antipsychotic activity by both DOPamine and serotonin type 2 ($5\text{-}HT_2$) antagonism; also, may antagonize muscarinic, histaminic ($H_1$), and α-adrenergic receptors

**Therapeutic outcome:** Decreased psychotic symptoms

**USES:** Schizophrenia, acute manic episodes in bipolar disorder, acute agitation

**Unlabeled uses:** Dementia related to Alzheimer's disease, OCD, acute psychosis

## CONTRAINDICATIONS
Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, geriatric, hypertension, cardiac/renal/hepatic disease, diabetes, agranulocytosis, abrupt discontinuation, Asian patients, closed-angle glaucoma, coma, leukopenia, QT prolongation, tardive dyskinesia, torsades de pointes, suicidal ideation, stroke history, TIA

**BLACK BOX WARNING:** Dementia, postinjection delirium/sedation syndrome

## DOSAGE AND ROUTES
### Schizophrenia
**Adult:** PO 5-10 mg/day initially, may increase dosage by 5 mg at ≥1 wk intervals; orally disintegrating tabs: open blister pack, place tab on tongue, let disintegrate, swallow; max 20 mg/day; ext rel inj (Zyprexa Relprevv) IM 150-300 mg q2wk or 405 mg q4wk
**Geriatric/debilitated:** PO 5 mg, may increase cautiously at 1 wk intervals, max 20 mg/day
**Adolescent:** PO 2.5 mg or 5 mg/day, target 10 mg/day

### Acute mania or mixed episodes associated with bipolar 1 disorder
**Adult:** PO 10-15 mg/day, may increase dose after 24 hr by 5 mg, max 20 mg/day
**Adolescent:** PO 2.5 or 5 mg/day, target 10 mg/day

### Acute agitation associated with schizophrenia, bipolar I mania
**Adult:** IM (reg rel) 10 mg once
**Geriatric:** IM (reg rel) 2.5-5 mg once

**Available forms:** **Tabs** 2.5, 5, 7.5, 10, 15, 20 mg; **orally disintegrating tabs** 5, 10, 15, 20 mg (Zyprexa Zydis); **powder for injection** 10 mg

### Implementation

- Give antiparkinsonian agent for EPS
- Give decreased dose in geriatric

**PO route**

- Give with full glass of water/milk or with food to decrease GI upset, may give without regard to food
- **Orally disintegrating tabs:** open blister pack; place tab on tongue until dissolved; swallow; no water needed, do not break, crush, chew
- Store in tight, light-resistant container

**IM route (Zyprexa Intramuscular)**

- Inspect for particulate, discoloration before use, if present, do not use
- Dissolve contents of vials with 2.1 ml sterile water for injection (5 mg/ml), use immediately
- Do not use IV or SUBCUT
- Inject slowly, deep into muscle mass

**IM route (Zyprexa Relprevv)**

**BLACK BOX WARNING:** Available only through restricted distribution program (Zyprexa Relprevv Patient Care program 877-772-9390) due to postinjection delirium/sedation syndrome; give at a facility with emergency services, monitor for 3 hr after injection

- Use gloves to prepare, irritating to skin
- Use deep IM gluteal inj only
- Use only diluent provided in kit; give q2-4wk using 19G 1.5-inch needle in kit, in obesity use 19G 2-inch or larger needle
- Provide supervised ambulation until stabilized on medication; do not involve in strenuous exercise program because fainting is possible; patients should not stand still for long periods
- Give increased fluids to prevent constipation
- Give sips of water, candy, gum for dry mouth
- Store in airtight, light-resistant container
- Give orally disintegrating tabs: open blister pack, place tab on tongue until dissolved, swallow; no water needed

## ADVERSE EFFECTS

**CNS:** EPS (pseudoparkinsonism, akathisia, dystonia, tardive dyskinesia), seizures, headache, neuroleptic malignant syndrome (rare), *agitation*, nervousness, hostility, dizziness, hypertonia, tremor, euphoria, confusion, *drowsiness,* fatigue, *abnormal gait, insomnia, fever,* suicidal thoughts

**CV:** Hypotension, tachycardia, chest pain, heart failure, sudden death (geriatric, IM), orthostatic hypotension, peripheral edema

**ENDO:** Increased prolactin levels, hyperglycemia, hypoglycemia

**GI:** Dry mouth, nausea, vomiting, anorexia, constipation, abdominal pain, weight gain, appetite, dyspepsia, jaundice, hepatitis

**GU:** Urinary retention, urinary frequency, enuresis, impotence, amenorrhea, gynecomastia, breast engorgement, premenstrual syndrome

**HEMA:** Neutropenia, agranulocytosis, leukopenia

**INTEG:** Rash

**MISC:** Peripheral edema, accidental injury, hypertonia, hyperlipidemia

**MS:** Joint pain, twitching

**RESP:** *Cough, pharyngitis,* fatal pneumonia (geriatric, IM)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | 93% plasma protein binding |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | PO 6 hr, IM 15-45 min |
| **Duration** | Unknown |

O

## INTERACTIONS

### Individual drugs

Alcohol: increased sedation, hypotension
Bromocriptine, levodopa: decreased antiparkinson activity
CarBAMazepine, omeprazole, rifampin: decreased levels of OLANZapine
Diazepam: increased hypotension
FluvoxaMINE: increased OLANZapine levels

### Drug classifications

Increase: QT prolongation: SSRIs
Anesthetics (barbiturates), antidepressants, antihistamines, CNS depressants, sedative/hypnotics: increased sedation
Anticholinergics: increased anticholinergic effects
Antihypertensives: increased hypotension
DOPamine agonists: decreased antiparkinson activity

### Drug/herb

Kava kava: Increase: toxicity
St. John's wort: Decrease: OLANZapine effect, avoid concurrent use

### Drug/lab test

Increased: liver function tests, prolactin, CPK

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Postinjection delirium/sedation syndrome (Zyprexa Relprevv)**: monitor continuously for ≥3 hr after injection; this patient must be accompanied when leaving: assess for sedation, coma, delirium, EPS, slurred speech, altered gait, aggression, dizziness, weakness, hypertension, seizures; before leaving, confirm the patient is alert, oriented, and free of any other symptoms

- Assess mental status, assess orientation, mood, behavior, presence of hallucinations and type before initial administration and monthly
- **Renal status:** Monitor I&O ratio; palpate bladder if low urinary output occurs, especially in geriatric
- Monitor bilirubin, CBC
- Monitor urinalysis; recommended before, during prolonged therapy
- Assess affect, orientation, LOC, reflexes, gait, coordination, sleep pattern disturbances
- Monitor B/P sitting, standing, lying; take pulse and respirations q4hr during initial treatment; establish baseline before starting treatment; report drops of 30 mm Hg; obtain baseline ECG
- **Serotonin syndrome:** assess for increased heart rate, shivering, sweating, dilated pupils, tremors, high B/P, hyperthermia, headache, confusion; if these occur, stop product, administer a serotonin antagonist if needed
- Assess dizziness, faintness, palpitations, tachycardia on rising
- **Assess for neuroleptic malignant syndrome:** Assess for hyperpyrexia, muscle rigidity, increased CPK, altered mental status, for acute dystonia (cheek chewing, swallowing, eyes, pill rolling)
- **EPS** including akathisia (inability to sit still, no pattern to movements), tardive dyskinesia (bizarre movements of the jaw, mouth, tongue, extremities), pseudoparkinsonism (rigidity, tremors, pill rolling, shuffling gait), suicidal thoughts, behaviors
- Monitor constipation, urinary retention daily; increase bulk, water in diet
- **Beers:** Avoid in older adults except for schizophrenia, bipolar disorder, or short-term use as an antiemetic during chemotherapy, increased risk of stroke

### Patient/family education

**BLACK BOX WARNING:** Teach patient about postinjection delirium/sedation syndrome; teach about all symptoms

- Teach patient to use good oral hygiene; frequent rinsing of mouth, candy, ice chips, sugarless gum for dry mouth
- Advise patient to avoid hazardous activities until product response is determined
- Advise patient that orthostatic hypotension occurs often and to rise from sitting or lying position gradually
- Advise patient to avoid hot tubs, hot showers, tub baths, since hypotension may occur
- Advise patient to avoid abrupt withdrawal of this product, or EPS may result; product should be withdrawn slowly
- Advise patient to avoid OTC preparations (cough, hay fever, cold) unless approved by prescriber, since serious product interactions may occur; avoid use with alcohol, CNS depressants, increased drowsiness may occur
- Advise patient that in hot weather, heat stroke may occur; take extra precautions to stay cool
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, may cause EPS in infant if used in third trimester, those pregnant should enroll in the National Pregnancy Registry for Atypical Antipsychotics 866-961-2388, excreted in breast milk, avoid breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Decrease in emotional excitement, hallucinations, delusions, paranoia, reorganization of patterns of thought, speech
- Teach patient to notify prescriber if pregnancy is planned or suspected, not to breastfeed
- Teach patient to take PO without regard to food

## TREATMENT OF OVERDOSE:

Lavage if orally ingested; provide airway; do not induce vomiting or use epinephrine

**⚠ HIGH ALERT**

## olaparib

(oh-lap′a-rib)

**Lynparza**

*Func. class.:* Antineoplastic-PARP

**USES:** Treatment of deleterious or suspected deleterious germline BRCA-mutated advanced ovarian cancer in patients who have not responded successfully to ≥3 prior courses of chemotherapy, as monotherapy

**CONTRAINDICATIONS:** Hypersensitivity, pregnancy

## DOSAGE AND ROUTES

**Adult female: PO** 400 mg bid until disease progression or unacceptable toxicity. Avoid use

of concomitant strong and moderate CYP3A4 inhibitors if possible.

**⚠ HIGH ALERT**

**RARELY USED**

## olaratumab

(oh-lar-atue-mab)

**Lartruvo**

*Func. class.:* Antineoplastic, monoclonal antibody

**USES:** The treatment of soft-tissue sarcoma not amenable to curative treatment with radiotherapy or surgery, in combination with doxorubicin

### CONTRAINDICATIONS

Hypersensitivity, pregnancy

### DOSAGE AND ROUTES

**Adult: IV** INF 15 mg/kg over 60 min on days 1 and 8 repeated q21 days until disease progression or unacceptable toxicity in combination with doxorubicin 75 mg/m$^2$ IV on day 1 repeated q21 days for up to 8 cycles

## olmesartan (Rx)

(ol-meh-sar'tan)

**Benicar, Olmetec**

*Func. class.:* Antihypertensive

*Chem. class.:* Angiotensin II receptor (type $AT_1$) antagonist

**Do not confuse:** Benicar/Mevacor

**ACTION:** Blocks the vasoconstrictor and aldosterone-secreting effects of angiotensin II; selectively blocks the binding of angiotensin II to the $AT_1$ receptor found in tissues

**Therapeutic outcome:** Decreased B/P

**USES:** Hypertension, alone or in combination with other antihypertensives

### CONTRAINDICATIONS

Hypersensitivity

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Breastfeeding, children, geriatric, hepatic disease, HF, renal artery stenosis, African descent, hyperkalemia

### DOSAGE AND ROUTES

#### Hypertension

**Adult:** PO single agent 20 mg/day initially in patients who are not volume depleted; may be increased to 40 mg/day if needed after 2 wk

**Adolescent ≤16 yr/child ≥6 yr weighing ≥35 kg:** PO 20 mg/day, may increase to max 40 mg/day after 2 wk

**Adolescent ≤16 yr/child ≥6 yr weighing 20-<35 kg:** PO 10 mg/day, may increase to max 20 mg/day after 2 wk

#### Volume depletion

**Adult:** PO start with lower dose

**Available forms:** Tabs 5, 20, 40 mg

#### Implementation

- Give without regard to meals
- Compounded suspension may be made in the pharmacy; refrigerate up to 1 mo; shake well before use

### ADVERSE EFFECTS

**CNS:** *Dizziness,* fatigue, insomnia, syncope
**CV:** Chest pain, peripheral edema, tachycardia, *hypotension*
**EENT:** Sinusitis, rhinitis, pharyngitis
**GI:** *Diarrhea,* abdominal pain
**META:** Hyperkalemia
**MS:** Arthralgia, pain, rhabdomyolysis
**RESP:** *Upper respiratory infection,* bronchitis
**SYST:** Angioedema

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Urine, feces |
| **Half-life** | Unknown |

#### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-2 hr |
| **Duration** | Unknown |

### INTERACTIONS

#### Individual drugs

Colesevelam: Decreased antihypertensive effect
Lithium, ACE inhibitors: increased effect

#### Drug classifications

Antihypertensives (other), diuretics: increased antihypertensive effects
NSAIDs: decreased antihypertensive effect
Antioxidants: increased effects
Potassium supplements, potassium-sparing diuretics: increased hyperkalemia

#### Drug/herb

Aconite: increased toxicity, death
Astragalus, cola tree: increased or decreased antihypertensive effect
Hawthorn: increased antihypertensive effect
Ephedra: decreased antihypertensive effect

O

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Assess for pregnancy;** this product can cause fetal death when given in pregnancy, assess for pregnancy before starting therapy, do not breastfeed

- Assess response and adverse reactions, especially in renal disease, monitor renal function
- Hypertension: Monitor B/P, pulse q4hr; note rate, rhythm, quality; electrolytes: sodium, potassium, chloride; baselines in renal, liver function tests before therapy begins, may use antihypertensives to control B/P if needed
- Hypotension: place supine; may occur with hyponatremia or in those with volume depletion; more common in those also taking a diuretic
- **Heart failure:** Monitor for edema, weight daily, jugular vein distention, dyspnea

### Patient/family education

- Advise to comply with dosage schedule, even if feeling better
- Advise patient to notify prescriber of mouth sores, fever, swelling of hands or feet, irregular heartbeat, chest pain, severe chronic diarrhea, severe weight loss
- Teach that excessive perspiration, dehydration, vomiting, diarrhea may lead to fall in B/P; to consult prescriber if these occur, maintain adequate hydration
- Teach that product may cause dizziness, fainting; light-headedness may occur, avoid hazardous activities
- Advise to rise slowly to sitting or standing position to minimize orthostatic hypotension

**BLACK BOX WARNING:** Teach to notify prescriber immediately if pregnant; not to use during breastfeeding

- Advise to avoid all OTC medications, unless approved by prescriber, severe chronic diarrhea, severe weight loss
- Teach patient that blood glucose may increase and antidiabetic product may need dosage change
- Advise to inform all health care providers of medication use
- Advise to use proper technique for obtaining B/P and acceptable parameters

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P

## olopatadine ophthalmic

*See Appendix B*

## olsalazine (Rx)

(ohl-sal′ah-zeen)

**Dipentum**

*Func. class.:* GI Antiinflammatory

*Chem. class.:* Salicylate derivative

**Do not confuse:** olsalazine/OLANZapine

**ACTION:** Bioconverted to 5-aminosalicylic acid, which decreases inflammation

**Therapeutic outcome:** Lessening of loose diarrhea stools and cramping

**USES:** Maintenance of remission of ulcerative colitis in patients intolerant to sulfasalazine

## CONTRAINDICATIONS

Hypersensitivity to this product or salicylates

**Precautions:** Pregnancy, breastfeeding, children <14 yr, impaired renal/hepatic function, severe allergy, bronchial asthma

## DOSAGE AND ROUTES

**Adult:** PO 500 mg bid, max 3 g/day

**Available forms:** Caps 250 mg

### Implementation

- Give total daily dose evenly spaced to minimize GI intolerance, give with food
- Store in tight, light-resistant container at room temperature

## ADVERSE EFFECTS

**CNS:** Headache, hallucinations, depression, vertigo, fatigue, dizziness

**GI:** Nausea, vomiting, abdominal pain, diarrhea, bloating, pancreatitis

**INTEG:** Rash, dermatitis, urticaria

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Colon 99% converted to mesalamine |
| **Distribution** | Colon |
| **Metabolism** | Liver |
| **Excretion** | Feces |
| **Half-life** | 0.9 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1 hr |
| **Duration** | 12 hr |

## INTERACTIONS

### Individual drugs

AzaTHIOprine: increased toxicity

Mercaptopurine, thioguanine: increased myelosuppression

Molecular-weight heparins, discontinue before using this product: Increase bleeding risk: low
Varicella vaccine, do not use within 6 wk of olsalazine: Increase Reye's syndrome development
Warfarin: increased pro-time, INR

### Drug/lab test
Increased: AST, ALT

## NURSING CONSIDERATIONS
### Assessment
- **Assess for allergic reaction:** rash, dermatitis, urticaria, pruritus, dyspnea, bronchospasm, sulfonamides
- **Colitis:** assess bowel pattern, number of stools, consistency, frequency, pain, mucus before treatment and periodically
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, avoid breastfeeding, excreted in breast milk

### Patient/family education
- Teach patient that lab work and exams will be needed during treatment
- Advise patient to take as prescribed, take missed dose as soon as remembered
- Inform patient not to operate machinery or drive until effects are known, may cause dizziness
- Advise patient to notify prescriber if symptoms do not improve or if allergic reaction or sore throat occurs
- Teach patient to report diarrhea, rash, bleeding, bruising, fever, hallucinations or if symptoms do not improve after 2 mo of therapy
- BUN, creatinine in those with renal disease; LFTs (liver disease); monitor I&O, output of 1500 ml/day is needed to prevent crystals in urine

### Evaluation
**Positive therapeutic outcome**
- Absence of fever, mucus in stools

## omalizumab (Rx)
(oh-mah-lye-zoo'mab)
**Xolair**
*Func. class.:* Antiasthmatic
*Chem. class.:* Monoclonal antibody

**ACTION:** Recombinant DNA-derived humanized IgG murine monoclonal antibody that selectively binds to IgE to limit the release of mediators in the allergic response

**Therapeutic outcome:** Ability to breathe more easily

**USES:** Moderate to severe persistent asthma, chronic idiopathic urticaria

## CONTRAINDICATIONS
Hypersensitivity to hamster protein

**BLACK BOX WARNING:** Hypersensitivity to this product

**Precautions:** Pregnancy, breastfeeding, children <12 yr, acute attacks of asthma, lymphoma, nephrotic disease, bronchospasm, neoplastic disease, status asthmaticus

## DOSAGE AND ROUTES
**Moderate to severe persistent asthma**
**Adult/adolescent/child ≥12 yr:** SUBCUT 150-300 mg × 2-4 wk, divide inj into 2 sites, if dose is >150 mg; dose is adjusted based on IgE levels and significant changes in body weight

**Chronic idiopathic urticaria in those who are symptomatic with antihistamines**
**Adult/adolescent/child >12 yr:** SUBCUT 150-300 mg q4wk

**Available forms:** Powder for inj, lyophilized 202.5 mg (150 mg/1.2 ml after reconstitution)

### Implementation
**SUBCUT route**
- Reconstitute using 1.4 ml sterile water for inj (150 mg/1.2 ml or 125 mg/ml); gently swirl to dissolve; allow vial to stand and q5min gently swirl for 5-10 sec to dissolve, some vials take ≥20 min, do not use if contents do not dissolve within 40 min, should be clear or slightly opalescent; use large-bore needle to withdraw medication; replace needle with small-bore needle
- Given q2-4wk; product is viscous; if >150 mg is given, divide into two sites; the inj may take 5-10 sec to administer
- Do not give more than 150 mg/inj site

## ADVERSE EFFECTS
**CV:** Heart failure, cardiomyopathy, hypotension, MI, PE, thrombosis
**HEMA:** Serious systemic eosinophilia
**INTEG:** Pruritus, dermatitis, inj site reactions, rash
**MISC:** Earache, dizziness, fatigue, pain, malignancies, viral infections, anaphylaxis, thrombocytopenia, headache
**MS:** Arthralgia, fracture, leg, arm pain
**RESP:** Sinusitis, upper respiratory tract infections, pharyngitis, pulmonary hypertension, bronchospasm

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Slow |
| **Distribution** | Unknown |
| **Metabolism** | Degradation by liver |
| **Excretion** | In bile |
| **Half-life** | 26 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 7-8 days |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Vaccines (live virus): use cautiously

### Drug/lab test

Increased: IgE

## NURSING CONSIDERATIONS

### Assessment

• Monitor respiratory rate, rhythm, depth; auscultate lung fields bilaterally; notify prescriber of abnormalities; monitor pulmonary function tests; serum IgE

**BLACK BOX WARNING: Assess for anaphylaxis, allergic reactions:** rash, urticaria, inability to breathe, edema of throat; observe for 2 hr, reaction can occur up to 24 hr; have emergency equipment available; product should be discontinued

• **Pregnancy/breastfeeding:** Use only if clearly needed, pregnant patients should enroll in EXPECT Pregnancy Registry 866-4XOLAIR, cautious use in breastfeeding, excretion unknown

### Patient/family education

• Advise patient that improvement will not be immediate

• Teach patient not to stop taking or decrease current asthma medications unless instructed by prescriber

**BLACK BOX WARNING:** Instruct patient to report signs of allergic reaction immediately, can be life-threatening

### Evaluation

**Positive therapeutic outcome**

• Ability to breathe more easily

## omeprazole (Rx, OTC)

(oh-mep'ra-zole)

**Losec, PriLOSEC, PriLOSEC OTC**

*Func. class.:* Antiulcer, proton pump inhibitor

*Chem. class.:* Benzimidazole

**Do not confuse:** PriLOSEC/Prinivil/omeprazole/fomepizole predniSONE/PROzac/Pristiq

**ACTION:** Suppresses gastric secretion by inhibiting hydrogen/potassium ATPase enzyme system in the gastric parietal cell; characterized as a gastric acid pump inhibitor, since it blocks the final step of acid production

**Therapeutic outcome:** Absence of duodenal ulcers; decreased gastroesophageal reflux

**USES:** Gastroesophageal reflux disease (GERD), severe erosive esophagitis, poorly responsive systemic GERD, pathologic hypersecretory conditions (Zollinger-Ellison syndrome, systemic mastocytosis, multiple endocrine adenomas); possibly effective for treatment of duodenal ulcers with or without antiinfectives for *Helicobacter pylori*

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children; Asian, Black patients

## DOSAGE AND ROUTES

### Active duodenal ulcers

**Adult:** PO 20 mg/day × 4-8 wk; associated with *H. pylori* 40 mg qAM and clarithromycin 500 mg tid on days 1-14, then 20 mg/day days 15-28

### Severe erosive esophagitis/poorly responsive GERD

**Adult:** PO (DEL REL cap/SUSP) 20 mg/day × 4-8 wk

### Pathologic hypersecretory conditions

**Adult:** PO 60 mg/day; may increase to 120 mg tid; daily doses >80 mg should be divided

### Gastric ulcer

**Adult:** PO 40 mg/day × 4-8 wk

**Geriatric:** PO max 20 mg/day

### Heartburn (OTC)

**Adult:** PO 1 DEL REL tab (20 mg) daily before AM meal with glass of water

**Available forms:** Del rel caps 10, 20, 40 mg, del rel tabs (PriLOSEC OTC) 20 mg; granules for oral susp 2.5, 10 mg (del rel)

### Implementation
• Swallow sus rel caps whole; do not break, crush, chew, or open
• Give before patient eats; may give with antacids

## ADVERSE EFFECTS
**CNS:** *Headache, dizziness, asthenia*
**GI:** *Diarrhea, abdominal pain, vomiting, nausea, constipation, flatulence, acid regurgitation,* abdominal swelling, anorexia, irritable colon, esophageal candidiasis, dry mouth, hepatic failure, CDAD
**INTEG:** Rash, dry skin, urticaria, pruritus, alopecia
**MISC:** *Back pain,* fever, fatigue, malaise
**RESP:** *Upper respiratory tract infections, cough,* epistaxis, pneumonia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Protein binding (95%); gastric parietal cells |
| **Metabolism** | Liver, extensively; by CYP2C19 Genetic Warning some Asians, Blacks, Caucasians are poor metabolizers |
| **Excretion** | Kidneys, feces |
| **Half-life** | ½-1 hr; increased in the geriatric, hepatic disease |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 1 hr |
| **Peak** | ½-3½ hr |
| **Duration** | 3-4 days |

## INTERACTIONS
### Individual drugs
Ampicillin: decreased effect of ampicillin
Calcium carbonate: decreased absorption of calcium carbonate
Cyanocobalamin: decreased absorption of cyanocobalamin
CycloSPORINE: increased cycloSPORINE levels
Diazepam: increased serum levels of diazepam
Digoxin: increased serum levels, delayed absorption of digoxin
Disulfiram: increased disulfiram levels
Flurazepam: increased flurazepam level
Gefitinib: decreased effect of gefitinib
Indinavir: decreased effect of indinavir
Iron salts: decreased absorption
Ketoconazole: decreased absorption of ketoconazole
Phenytoin: increased serum levels of phenytoin
Triazolam: increased triazolam level
Warfarin: increased bleeding tendencies

### Drug classifications
Iron products: decreased absorption of iron

### Drug/lab test
Increased: alkaline phosphatase, AST, ALT, bilirubin, gastrin

## NURSING CONSIDERATIONS
### Assessment
• ***Clostridium difficile*-associated diarrhea (CDAD):** Assess for fever, abdominal pain, bloody stool, report to prescriber immediately, may occur up to several weeks after conclusion of therapy
• **Electrolyte imbalances:** hyponatremia, hypomagnesemia in those using this product 3 mo-1 yr; if hypomagnesemia occurs, use of magnesium supplement may be sufficient; if severe, discontinue use
• Assess GI system: bowel sounds q8hr, abdomen for pain and swelling, anorexia
• **Monitor hepatic enzymes:** AST, ALT, increased alkaline phosphatase during treatment; blood studies; CBC, differential during treatment, blood dyscrasias may occur; vitamin $B_{12}$ in long-term treatment
• Teach patient to take as directed, even if feeling better; to take missed dose as soon as remembered; not to double; PriLOSEC OTC can take up to 4 days for full effect
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excreted in breast milk
• **Beers:** Avoid scheduled use >8 wk in those with hypersecretory condition, esophagitis, risk of *Clostridium difficile*, and fractures

### Patient/family education
• Advise patient to report severe diarrhea; black, tarry stools; abdominal cramps/pain, continuing headache; product may have to be discontinued
• Teach patient to report if pregnancy is planned or suspected
• Teach patient not to use OTC, Rx, or herbs without prescriber consent
• Caution patient to avoid driving and other hazardous activities until response to product is known
• Caution patient to avoid alcohol, salicylates, ibuprofen; may cause GI irritation

### Evaluation
#### Positive therapeutic outcome
• Absence of epigastric pain, swelling, fullness

## ondansetron (Rx)

(on-dan′sa-tron)

**Ondissolve, Zofran, Zofran ODT, Zuplenz ODF**

*Func. class.:* Antiemetic

*Chem. class.:* 5-HT receptor antagonist

**Do not confuse:** Zofran/Zantac

**ACTION:** Prevents nausea, vomiting by blocking serotonin (5-HT) peripherally, centrally, and in the small intestine

**Therapeutic outcome:** Control of nausea, vomiting

**USES:** Prevention of nausea, vomiting associated with cancer chemotherapy, radiotherapy, and prevention of postoperative nausea, vomiting

**Unlabeled uses:** Bulimia, pruritus (rectal use), alcoholism, severe vomiting in pregnancy

## CONTRAINDICATIONS

Hypersensitivity; phenylketonuric hypersensitivity (oral disintegrating tab), torsades de pointes

**Precautions:** Pregnancy, breastfeeding, children, geriatric, granisetron hypersensitivity, QT prolongation, torsades de pointes

## DOSAGE AND ROUTES

### Prevention of nausea/vomiting (cancer chemotherapy)

**Adult and child 4-18 yr:** **IV** 0.15 mg/kg infused over 15 min, 30 min before start of cancer chemotherapy, max 16 mg/dose; 0.15 mg/kg is given 4 hr and 8 hr after first dose or 16 mg as a single dose; dilute in 50 ml of $D_5$ or 0.9% NaCl before giving; RECT (unlabeled) 16 mg daily 2 hr before chemotherapy; PO 8 mg ½ hr prior to chemotherapy, repeat 4, 8 hr after 1st dose

**Child ≥4 yr:** PO 4 mg ½ hr prior to chemotherapy

### Prevention of nausea/vomiting (radiotherapy)

**Adult:** PO 8 mg tid, may repeat q8hr

### Prevention of postoperative nausea/vomiting

**Adult:** **IV**/IM 4 mg undiluted over >30 sec prior to induction of anesthesia

**Child 2-12 yr:** **IV** 0.1 mg/kg (≤40 kg); 4 mg (≥40 kg), give ≥30 sec

### Hepatic dose

**Adult:** PO/IM/IV max dose 8 mg daily

### Severe vomiting in pregnancy (unlabeled)

**Adult:** PO/**IV** 4-8 mg bid-tid

### Pruritus (unlabeled)

**Adult:** PO 4 mg bid

### Alcoholism (unlabeled)

**Adult:** PO 4 mcg/kg bid

**Available forms:** Inj 2 mg/ml, 32 mg/50 ml (premixed); tabs 4, 8 mg; oral sol 4 mg/5 ml; oral disintegrating tabs 4, 8 mg; oral dissolving film 4.8 mg

### Implementation

**PO route**

- Regular tab; protect from light (4-mg tab)
- **Oral disintegrating tab:** do not push through foil; gently remove and immediately place on tongue to dissolve, swallow with saliva
- **Oral dissolving film:** fold pouch along dotted line to expose near notch; while folded, tear and remove film, place film on tongue until dissolved, swallow after dissolved; to reach desired dose, administer successive films, allowing each to dissolve before using another
- Check for discoloration or particulate; if particulate is present, shake to dissolve

**Oral solution**

- Protect from light
- Measure in calibrated oral syringe or other calibrated device

**IM route**

- Visually inspect for particulate or discoloration
- May give 4 mg undiluted IM; inject deeply in large muscle mass, aspirate

**Direct IV route**

- Give **IV** after diluting a single dose in 50 ml of 0.9% NaCl or $D_5W$, 0.45% NaCl; give over 15 min
- Store at room temperature for 48 hr after dilution
- Do not use IV 32-mg dose in chemotherapy; nausea/vomiting due to QT prolongation, max 16 mg/dose (adult)

**Y-site compatibilities:** Aldesleukin, amifostine, amikacin, aztreonam, bleomycin, CARBOplatin, carmustine, ceFAZolin, ceforanide, cefotaxme, cefOXitin, cefTAZidime, ceftizoxime, cefuroxime, chlorproMAZINE, cimetidine, cisatracurium, CISplatin, cladribine, clindamycin, cyclophosphamide, cytarabine, dacarbazine, DACTINomycin, DAUNOrubicin, dexamethasone, diphenhydrAMINE, DOXOrubicin, DOXOrubicin liposome, doxycycline, droperidol, etoposide, famotidine, filgrastim, floxuridine, fluconazole, fludarabine, gentamicin, haloperidol, heparin, hydrocortisone, HYDROmorphone, hydrOXYzine, ifosfamide, imipenem/cilastatin, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, mesna,

methotrexate, metoclopramide, miconazole, mitoMYcin, mitoXANtrone, morphine, PACLitaxel, pentostatin, potassium chloride, prochlorperazine, ranitidine, remifentanil, streptozocin, teniposide, thiotepa, ticarcillin, ticarcillin/clavulanate, vancomycin, vinBLAStine, vinCRIStine, vinorelbine, zidovudine

**Y-site incompatibilities:** Acyclovir, aminophylline, amphotericin B, ampicillin, ampicillin/sulbactam, cefoperazone, furosemide, ganciclovir, LORazepam, methylPREDNISolone, mezlocillin, piperacillin, sargramostim, sodium bicarbonate

## ADVERSE EFFECTS

**CNS:** *Headache,* dizziness, drowsiness, fatigue, EPS

**GI:** *Diarrhea, constipation, abdominal pain,* dry mouth

**MISC:** Rash, bronchospasm (rare), *musculoskeletal pain, wound problems, shivering, fever, hypoxia, urinary retention*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Completely absorbed (**IV**) |
| **Distribution** | Unknown |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys |
| **Half-life** | 3.5-4.7 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Apomorphine: increased unconsciousness, hypotension: do not use together

CarBAMazepine, phenytoin, rifampin: decreased ondansetron effect

### Drug classifications

Increased QT prolongation with other products that prolong QT

### Drug/lab test

Increased: LFTs

## NURSING CONSIDERATIONS

### Assessment

- Assess for absence of nausea, vomiting during chemotherapy
- Assess for hypersensitivity reaction: rash, bronchospasm
- **Assess for EPS** shuffling gait, tremors, grimacing, rigidity
- **QT prolongation:** monitor ECG in those with hypokalemia, hypomagnesemia, cardiac disease and those receiving other products that increase QT
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, cardiac malformations, oral clefts may occur
- **Serotonin syndrome:** Occurs when other products are given that increase CNS or peripheral serotonin levels; agitation, confusion, dizziness, diaphoresis, flushing, tremor, seizures, nausea, vomiting, diarrhea, product should be discontinued

### Patient/family education

- Instruct patient to report diarrhea, constipation, rash, changes in respirations, or discomfort at insertion site, serotonin syndrome, EPS symptoms
- Teach patient reason for medication and expected results
- Drink with full glass of water (PO)
- **Oral disintegrating tab:** Remove strip from pouch, place on tongue, and allow to dissolve, drink water

### Evaluation

**Positive therapeutic outcome**

- Absence of nausea

# oritavancin

(or-it'a-van'sin)

**Orbactiv**

*Func. class.:* Antiinfective agent

*Chem. class.:* Glycopeptide

**ACTION:** Inhibits bacterial cell-wall biosynthesis by preventing transglycosylation (polymerization) by binding to precursors, as well as by preventing cross-linking by binding to the peptide bridging segments of the cell wall; also disrupts the bacterial cell membrane integrity, resulting in depolarization, increased permeability, and eventual cell death

**Therapeutic outcome:** Resolution of infection

**USES:** *Enterococcus faecalis, Enterococcus faecium, Staphylococcus aureus* (MRSA), *Staphylococcus aureus* (MSSA), *Streptococcus agalactiae* (group B streptococci), *Streptococcus anginosus, Streptococcus constellatus, Streptococcus dysgalactiae, Streptococcus intermedius, Streptococcus pyogenes* (group A β-hemolytic streptococci); treatment of acute bacterial skin and skin structure infections (ABSSSI) due to gram-positive organisms, including cellulitis/erysipelas, major cutaneous abscesses, and wound infections

**CONTRAINDICATIONS:** Hypersensitivity

**Precautions:** Anticoagulant therapy, antimicrobial resistance, breastfeeding, colitis, diarrhea, inflammatory bowel disease, infusion reactions, pregnancy pseudomembranous colitis, vancomycin hypersensitivity, viral infection

## DOSAGE AND ROUTES

**Adult: IV** 1200 mg as a single dose

**Available forms:** Powder for injection: 400 mg

### Implementation

- Visually inspect for particulate matter and discoloration beforehand; the reconstituted solution is clear, colorless to pale yellow
- Reconstitution: Reconstitute each 400-mg vial with 40 ml sterile water for injection. Three vials are necessary for a single dose; gently swirl until dissolved.
- Dilution: Withdraw and discard 120 ml from a 1000-ml intravenous bag of $D_5W$, transfer 40 ml solution from each of the 3 reconstituted vials to the $D_5W$ IV bag (1.2 mg/ml)
- Storage: Refrigerate or store at room temperature. The combined storage time (from reconstitution to dilution) and 3-hour infusion time should not exceed 6 hr at room temperature or 12 hr if refrigerated.

**Intermittent IV INF**

- Infuse over 3 hr, do not infuse with other medications or electrolytes, do not use saline-based solution

## ADVERSE EFFECTS

**CNS:** Dizziness, flushing, headache
**CV:** Sinus tachycardia, phlebitis
**GI:** Nausea, vomiting, diarrhea
**HEMA:** Anemia, eosinophilia
**INTEG:** Rash, vasculitis, pruritus, angioedema, infusion-related reaction
**MISC:** Wheezing, bronchospasm
**MS:** Myalgia, osteomyelitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 85% protein binding |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Terminal half-life 245 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Products metabolized by CYP2D6 and CYP3A4: Increased toxicity
Increase: Bleeding risk: warfarin, avoid concurrent use

### Drug/lab test

Increased: LFTs, uric acid, INR, aPTT

## NURSING CONSIDERATIONS

### Assessment

- Monitor CBC and differential
- Infusion-related reactions, symptoms of red man's syndrome (flushing, urticaria, pruritus), slow or stop infusion
- Assess for diarrhea, bloody stools, cramping
- Avoid heparin for 5 days after use of this product, a false elevated aPTT and coagulation studies occur
- Assess for fever; report to health care professional, may be *Clostridium difficile*-associated diarrhea (CDAD), may start up to 8 wk after completion of treatment
- C&S before therapy, may give product before receiving results

### Patient/family education

- Teach patient reason for product, expected result
- Advise patient product is used only once to resolve infection
- **Bowel function:** To notify health care professional of diarrhea, bloody stools, cramping, fever, do not self-treat
- Teach patient to notify prescriber of rash, facial swelling, dyspnea
- Teach patient to avoid use of all OTC herbs unless approved by prescriber
- Teach patient to notify prescriber if pregnancy is planned or suspected
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Resolution of infection

## oseltamivir (Rx)

(oh-sell-tam'ih-ver)
**Tamiflu**
*Func. class.:* Antiviral
*Chem. class.:* Neuraminidase inhibitor

**ACTION:** Inhibits influenza virus neuraminidase with possible alteration of virus particle aggregation and release

**Therapeutic outcome:** Decreased symptoms of influenza type A

**USES:** Prevention/treatment of influenza type A or B

**Unlabeled uses:** Avian influenzae (H5N1), swine flu (H1N1), encephalitis

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, geriatric, renal/hepatic/pulmonary/cardiac disease, infants, children, neonates, psychosis, viral infection, breastfeeding

## DOSAGE AND ROUTES

### Treatment

**Adult and child >40 kg:** PO 75 bid mg × 5 days, begin treatment within 2 days of onset of symptoms
**Child 23-40 kg and ≥1 yr:** PO 60 mg bid
**Child 15-23 kg and ≥1 yr:** PO 45 mg bid
**Child ≤15 kg and ≥1 yr:** PO 30 mg bid

### Prevention

**Adult and child ≥13 yr:** PO 75 mg/day × ≥7 days; begin treatment within 2 days of contact, max use 6 wk

### Renal dose

**Adult:** PO CCr 10-30 ml/min 75 mg/day × 5 days (treatment); 75 mg every other day or 30 mg/day (prophylaxis)

### H1N1 influenzae A virus (unlabeled)

**Adult/adolescent/child >40 kg:** PO 75 mg bid × 5 days
**Child/adolescent 24-40 kg:** PO 60 mg bid × 5 days
**Child >1 yr and 15-23 kg:** PO 45 mg bid × 5 days
**Child >1 yr and <15 kg:** PO 30 mg bid × 5 days

**Available forms:** Caps 30, 45, 75 mg; powder for oral susp 6 mg/ml

### Implementation

- Give within 2 days of symptoms of influenza; continue for 5 days
- Give at least 4 hr before bedtime to prevent insomnia
- 12 mg/ml concentration will be available for a limited time, new product is 6 mg/ml concentration, take care to give correct dose
- Give without regard to food, give with food for GI upset, take with full glass of water
- **Oral susp:** loosen powder from side of bottle 55 ml shake well (6 mg/ml); remove child-resistant cap and push bottle adapter into neck of bottle, close tightly with child-resistant cap to ensure sealing; use within 17 days of preparation when refrigerated or 10 days at room temperature, write expiration date on bottle, shake well before use, use oral syringe provided but only with markings for 30, 45, 60 mg, confirm dosing instructions are in same units as syringe provided
- Store in airtight, dry container

## ADVERSE EFFECTS

**CNS:** Headache, fatigue, insomnia, dizziness, delirium, self-injury (children)
**ENDO:** Hyperglycemia
**GI:** *Nausea, vomiting,* diarrhea, abdominal pain
**INTEG:** Toxic epidermal necrolysis, Stevens-Johnson syndrome, erythema multiforme
**RESP:** Cough

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Protein binding 3% |
| **Metabolism** | Converted to oseltamivir carboxylate (active form) |
| **Excretion** | Eliminated by conversion, urine 99% |
| **Half-life** | 1-3 hr (active form) |

### Pharmacodynamics

Unknown

## INTERACTIONS

Increase: Oseltamivir metabolites probenecid
Avoid use with H1N1 virus vaccine, intranasal influenza vaccine

## NURSING CONSIDERATIONS

### Assessment

- **Influenza:** assess for symptoms of influenza A: increased temperature, malaise, aches and pains
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, may be used for influenza, may breastfeed
- **Behavioral symptoms:** Assess for hallucinations, abnormal behaviors, delirium

### Patient/family education

- Teach patient about aspects of product therapy
- Teach patient to avoid hazardous activities if dizziness occurs
- Advise patient to take as soon as symptoms appear, to take full course, even if feeling better
- Advise patient to take missed dose as soon as remembered if within 2 hr of next dose
- Teach patient to stop product immediately and report to prescriber skin rash, delirium, psychosis, hallucinations (child)
- Advise patient that product is not a substitute for a flu shot
- Inform patient to avoid other products without approval of prescriber

O

## Evaluation

**Positive therapeutic outcome**

• Absence of fever, malaise, cough, dyspnea in influenza A

**⚠ HIGH ALERT**

# oxaliplatin (Rx)

(ox-al-i'plat-in)

**Eloxatin**

*Func. class.:* Antineoplastic

*Chem. class.:* 3rd-generation platinum analog

**ACTION:** Forms cross links, inhibiting DNA replication and transcription, cell-cycle nonspecific

**Therapeutic outcome:** Decreased size of tumor, spread of malignancy

**USES:** Metastatic carcinoma of the colon or rectum in combination with 5-FU/leucovorin

**Unlabeled uses:** Relapsed or refractory non-Hodgkin's lymphoma, advanced ovarian cancer

## CONTRAINDICATIONS

Pregnancy, breastfeeding, radiation therapy or chemotherapy within 1 mo, thrombocytopenia, smallpox vaccination

**BLACK BOX WARNING:** Hypersensitivity to this product or other platinum products

**Precautions:** Children, geriatric, pneumococcus vaccination, renal disease

## DOSAGE AND ROUTES

### First-line treatment for advanced colorectal cancer with 5-FU and leucovorin (5-FU/LV)

Dosage protocols may vary

**Adult: IV** INF *Day 1:* oxaliplatin 85 mg/m$^2$ in 250-500 ml $D_5W$ and leucovorin 200 mg/m$^2$ in $D_5W$, give both over 2 hr at the same time in separate bags using a Y-line, followed by 5-FU 400 mg/m$^2$ **IV** BOL over 2-4 min, then 5-FU 600 mg/m$^2$ **IV** INF in 500 ml $D_5W$ as a 22-hr CONT INF; *Day 2:* leucovorin 200 mg/m$^2$ **IV** INF over 2 hr, then 5-FU 400 mg/m$^2$ **IV** BOL over 2-4 min, then 5-FU 600 mg/m$^2$ **IV** INF in 500 ml $D_5W$ as a 22-hr CONT INF; repeat cycle q2wk

With 5-FU/LV for adjuvant treatment of stage III colon cancer in those who have had complete resection of the primary tumor

### Renal dose

**Adult:** IV CCr <30 ml/min: reduce starting dose to 65 mg/m$^2$

**Available forms:** Powder for inj 50, 100 mg single-use vials (5 mg/ml); solution for inj 50 mg/10 ml, 100 mg/20 ml, 200 mg/40 ml

## Implementation

**Intermittent IV INF route**

• Premedicate with antiemetics including 5-$HT_3$ blockers, with or without dexamethasone, prehydration is not needed

• Do not reconstitute or dilute with sodium chloride or any chloride-containing solutions, do not use aluminum equipment during any preparation or administration, will degrade platinum; do not refrigerate unopened powder or solution; do not freeze; protect from light

• Use cytotoxic handling procedures; prepare in biological cabinet using gown, gloves, mask; do not allow product to come in contact with skin; use soap and water if contact occurs

• EPINEPHrine, antihistamines, corticosteroids for hypersensitivity reaction

• **Lyophilized powder:** reconstitute vial 50 mg/10 ml, or 100 mg/20 ml sterile water for inj or $D_5W$, after reconstitution, solution may be stored for ≤24 hr in refrigerator, after dilution in 250-500 ml $D_5W$, may store ≤24 hr in refrigerator or 6 hr at room temp, infuse over 2 hr

• **Aqueous solution:** dilute in 250-500 ml of $D_5W$, after dilution may store ≤24 hr refrigerator, 6 hr at room temp, infuse over 2 hr

**Y-site compatibilities:** Alfentanil, amifostine, amikacin, aminocaproic acid, amiodarone, amphotericin B colloidal, amphotericin B lipid complex, amphotericin B liposome, ampicillin, ampicillin-sulbactam, anidulafungin, atenolol, atracurium, azithromycin, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, ceFAZolin, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, cyclophosphamide, cycloSPORINE, cytarabine, dacarbazine, DACTINomycin, DAPTOmycin, DAUNOrubicin, dexamethasone, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doxacurium, DOXOrubicin, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, ertapenem, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, foscarnet, fosphenytoin, furosemide, gatifloxacin, gemcitabine, gemtuzumab, gentamicin, glycopyrrolate, granisetron, haloperidol, heparin, hydrALAZINE, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, inamrinone, insulin (regular),

irinotecan, isoproterenol, ketorolac, labetalol, leucovorin, levofloxacin, levorphanol, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, meperidine, meropenem, mesna, metaraminol, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, minocycline, mitoMYcin, mitoXANtrone, mivacurium, morphine, nafcillin, nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, PACLitaxel, palonosetron, pancuronium, PEMEtrexed, pentamidine, pentazocine, phenylephrine, piperacillin, polymyxin B, potassium chloride/phosphates, procainamide, prochlorperazine, promethazine, propranolol, quiNIDine, quinupristin-dalfopristin, ranitidine, rocuronium, sodium acetate/phosphates, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, tacrolimus, teniposide, theophylline, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, topotecan, trimethobenzamide, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CNS:** Peripheral neuropathy, fatigue, headache, dizziness, insomnia, reversible posterior leukoencephalopathy syndrome
**CV:** Cardiac abnormalities, thromboembolism
**EENT:** *Decreased visual acuity, tinnitus, hearing loss*
**GI:** *Severe nausea, vomiting, diarrhea, weight loss,* stomatitis, anorexia, gastroesophageal reflux, constipation, dyspepsia, mucositis, flatulence
**GU:** Hematuria, dysuria, creatinine
**HEMA:** Thrombocytopenia, leukopenia, pancytopenia, neutropenia, anemia, hemolytic uremic syndrome
**INTEG:** *Alopecia,* rash, flushing, extravasation, redness, swelling, pain at inj site
**META:** Hypokalemia
**RESP:** Fibrosis, dyspnea, cough, rhinitis, URI, pharyngitis
**SYST:** Anaphylaxis, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 15% of platinum in systemic circulation; 85% is either in tissues or being eliminated in urine |
| **Metabolism** | Liver |
| **Excretion** | Urine |
| **Half-life** | 40 days |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Alcohol, aspirin: increased risk of bleeding
Radiation: increased myelosuppression

### Drug classifications

Aminoglycosides, diuretics (loop): increased nephrotoxicity
Anticoagulants, NSAIDs, platelet inhibitors, thrombolytics, salicylates: increased risk of bleeding
Live virus vaccines: decreased antibody response
Myelosuppressives: increased myelosuppression
Tannins: increased oxaliplatin toxicity

### Drug/lab test

Increased: ALT, AST, bilirubin, creatinine
Decreased: potassium, neutrophils, WBC, platelets

## NURSING CONSIDERATIONS

### Assessment

- **Bone marrow depression:** monitor CBC, differential, platelet count weekly; withhold product if WBC is <4000 or platelet count is <100,000; notify prescriber of results
- Monitor renal function tests: BUN, creatinine, serum uric acid, urine CCr before, electrolytes during therapy; dose should not be given if BUN >19 mg/dl; creatinine <1.5 mg/dl; I&O ratio; report fall in urine output of <30 ml/hr

**BLACK BOX WARNING: Assess for anaphylaxis:** wheezing, tachycardia, facial swelling, fainting, rash, dyspnea, hives; discontinue product and report to prescriber; resuscitation equipment should be nearby with EPINEPHrine, corticosteroids

- **Reversible posterior leukoencephalopathy syndrome:**
- Monitor temp (may indicate beginning infection)
- Monitor liver function tests before, during therapy (bilirubin, AST, ALT, LDH) as needed or monthly
- **Assess for bleeding:** hematuria, guaiac, bruising or petechiae, mucosa or orifices q8hr; obtain prescription for viscous lidocaine (Xylocaine)
- Assess effects of alopecia on body image; discuss feelings about body changes
- Assess for jaundice of skin, sclera; dark urine; clay-colored stools; itchy skin; abdominal pain; fever; diarrhea
- Assess for edema in feet, joint pain, stomach pain, shaking

- **Pulmonary fibrosis:** assess for cough, crackles, dyspnea, pulmonary infiltrate; discontinue immediately; may be fatal
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

- **Advise patient to report signs of infection:** increased temp, sore throat, flulike symptoms
- **Advise patient to report signs of anemia:** fatigue, headache, faintness, shortness of breath, irritability
- **Advise patient to report bleeding;** avoid use of razors, commercial mouthwash
- Advise patient to avoid aspirin, ibuprofen, NSAIDs, alcohol; may cause GI bleeding
- Advise patient to report any changes in breathing, coughing
- Advise patient that hair may be lost during treatment; a wig or hairpiece may make patient feel better; new hair may be different in color, texture
- Advise patient to report numbness, tingling in face or extremities, poor hearing or joint pain, swelling
- Advise patient not to receive vaccines during treatment
- Advise patient to use contraception during treatment and 4 mo after; this product may cause infertility, pregnancy D
- Teach patient to avoid contact with cold (air, ice, liquid); causes acute dysesthesias

### Evaluation

**Positive therapeutic outcome**

- Decreased tumor size, spread of malignancy

**⚠ HIGH ALERT**

## oxazepam (Rx)

(ox-az′e-pam)

**Novoxapan, Serax, Zopex**

*Func. class.:* Sedative-hypnotic; antianxiety

*Chem. class.:* Benzodiazepine, short-acting

**Controlled substance schedule IV**

**ACTION:** Depresses subcortical levels of CNS, including limbic system, reticular formation; potentiates GABA

**Therapeutic outcome:** Decreased anxiety, successful alcohol withdrawal, relaxation

**USES:** Anxiety, alcohol withdrawal

**Unlabeled uses:** Insomnia

## CONTRAINDICATIONS

Pregnancy, breastfeeding, children <6 yr, hypersensitivity to benzodiazepines, closed-angle glaucoma, psychosis

**Precautions:** Geriatric, debilitated, renal/hepatic disease, depression, suicidal ideation, dementia, sleep apnea, seizure disorder

**BLACK BOX WARNING:** Depressants, respiratory depression

## DOSAGE AND ROUTES

### Anxiety

**Adult:** PO 15-30 mg tid-qid, max 120 mg/day
**Geriatric:** PO 10 mg daily bid-tid, max 60 mg/day

### Alcohol withdrawal

**Adult:** PO 15-30 mg tid-qid

### Severe anxiety syndrome; agitation; anxiety with depression

**Adult and child >12 yr:** PO 15-30 mg tid-qid

**Available forms:** Caps 10, 15, 30 mg

### Implementation

- Give with food or milk for GI symptoms; tab may be crushed if patient is unable to swallow medication whole
- Taper product (0.5 mg q3day) before discontinuing

## ADVERSE EFFECTS

**CNS:** *Dizziness, drowsiness,* confusion, headache, anxiety, tremors, fatigue, depression, insomnia, hallucinations, paradoxical excitement, transient amnesia
**CV:** *Orthostatic hypotension,* ECG changes, tachycardia, hypotension
**EENT:** *Blurred vision,* tinnitus, mydriasis
**GI:** Nausea, vomiting, anorexia, drug-induced hepatitis
**HEMA:** Leukopenia
**INTEG:** Rash, dermatitis, itching
**SYST:** Dependence

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed; crosses placenta, blood-brain barrier |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 5-15 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ½-1½ hr |
| **Peak** | Unknown |
| **Duration** | 6-12 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
Disulfiram: increased oxazepam effects
Levodopa: decreased effects of levodopa
Phenytoin, theophylline, valproic acid: decreased oxazepam effects

### Drug classifications

**BLACK BOX WARNING:** CNS depressants: increased oxazepam effects, respiratory depression

**BLACK BOX WARNING:** Oral contraceptives: increased or decreased oxazepam effect

### Drug/herb

Kava, melatonin, valerian: increased CNS depression

### Drug/lab test

Increased: AST, ALT, serum bilirubin
Decreased: WBC

## NURSING CONSIDERATIONS

**BLACK BOX WARNING:** Respiratory depression: Not to be used in preexisting respiratory depression, use cautiously in severe pulmonary disease, monitor respirations

### Assessment

- Monitor CBC and LFTs, periodically
- **Pregnancy:** Assess for pregnancy before use, do not use in pregnancy, do not breastfeed
- **Assess mental status:** mood, sensorium, anxiety, affect, sleeping pattern, drowsiness, dizziness, suicidal thoughts, behavior; physical dependency, withdrawal symptoms: anxiety, panic attacks, agitation, seizures, headache, nausea, vomiting, muscle pain, weakness, sedation suicidal thoughts, behavior; indications of increasing tolerance and abuse
- Monitor B/P with patient lying, standing; pulse; if systolic B/P drops 20 mm Hg, hold product, notify prescriber
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding
- **Beers:** Avoid in older adults, delirium, cognitive impairment may occur

### Patient/family education

- Teach patient that product may be taken without regard to food or fluids; tab may be crushed or swallowed whole
- Caution patient not to use for everyday stress or longer than 4 mo unless directed by prescriber; not to take more than prescribed amount; not to double doses or skip doses
- Advise patient to avoid OTC preparations unless approved by prescriber; alcohol and CNS depressants will increase CNS depression
- Caution patient to avoid driving and activities that require alertness, since drowsiness may occur; to avoid alcohol and other psychotropic medications; to rise slowly or fainting may occur, especially geriatric; that drowsiness may worsen at beginning of treatment
- Caution patient not to discontinue medication abruptly after long-term use; withdrawal symptoms include vomiting, cramping, tremors, seizures
- Advise patient to use sugarless gum, hard candy, frequent sips of water for dry mouth
- Teach patient that drowsiness may worsen at beginning of treatment
- Teach patient to notify prescriber if pregnancy is planned or suspected, pregnancy

### Evaluation

**Positive therapeutic outcome**

- Decreased anxiety, restlessness, sleeplessness (short-term treatment only)

## TREATMENT OF OVERDOSE:

Lavage, VS, supportive care

## OXcarbazepine (Rx)

(ox′kar-baz′uh-peen)
**Oxtellar XR, Trileptal**
*Func. class.:* Anticonvulsant

**Do not confuse:** OXcarbazepine/carBAMazepine/oxaprozin

**ACTION:** May inhibit nerve impulses by limiting influx of sodium ions across cell membrane in motor cortex

**Therapeutic outcome:** Absence of seizures

**USES:** Partial seizures

**Unlabeled uses:** Trigeminal neuralgia, atypical panic disorder, bipolar disorder

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children <4 yr, hypersensitivity to carbamazepine, renal disease, fluid restriction, hyponatremia,

abrupt discontinuation, suicidal ideation, positive for HLA-B 1502 allele

## DOSAGE AND ROUTES

### Seizures adjunctive therapy

**Adult:** PO 300 mg bid, may be increased by 600 mg/day in divided doses bid at weekly intervals; maintenance 1200 mg/day; ext rel 600 mg/day × 1 wk, increase weekly in 600 mg/day increments to 1200-2400 mg/day

**Child 4-16 yr:** PO 8-10 mg/kg/day divided bid, dose is determined by weight, increase by 5 mg/kg/day q3 days, max doses are weight dependent

### Conversion to monotherapy in partial seizures

**Adult:** PO 300 mg bid with reduction in other anticonvulsants, increase OXcarbazepine by 600 mg/day qwk over 2-4 wk; withdraw other anticonvulsants over 3-6 wk, max 2400 mg/day

### Initiation of monotherapy in partial seizures

**Adult:** PO 300 mg bid, increase by 300 mg/day q3day to 1200 mg divided bid, max 2400 mg/day

### Renal dose

**Adult:** PO CCr <30 ml/min 150 mg bid and increase slowly

**Available forms:** Film-coated tabs 150, 300, 600 mg; oral susp 300 mg/5 ml; ext rel tab 150, 300, 600 mg

### Implementation

- Store product at room temperature
- Provide assistance with ambulation during early part of treatment; dizziness may occur
- Give product with food, milk to decrease GI symptoms
- **Oral susp:** shake well, use calibrated oral syringe provided, use or discard within 7 days of opening
- **Ext rel:** do not crush, break, or chew

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness, confusion, fatigue,* feeling abnormal, ataxia, abnormal gait, tremors, anxiety, agitation, worsening of seizures, suicidal ideation/behavior

**CV:** *Hypotension,* chest pain, edema, bradycardia, syncope

**EENT:** *Blurred vision, diplopia, nystagmus,* rhinitis, sinusitis

**ENDO:** Hypothyroidism, hot flashes

**GI:** *Nausea, constipation, diarrhea,* anorexia, vomiting, abdominal pain, gastritis

**GU:** Urinary frequency, hematuria, menses change

**INTEG:** Purpura, rash, acne

**META:** Hyponatremia

**RESP:** Flulike symptoms

**SYST:** Angioedema, anaphylaxis, Stevens-Johnson syndrome, toxic epidermal necrolysis, drug reaction with eosinophilia and systemic symptoms (DRESS)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver; 95% renal extraction |
| **Excretion** | Unknown |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 4-6 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual products

Alcohol: increased CNS depression
CarBAMazepine: decreased carBAMazepine level, decreased OXcarbazepine levels
Felodipine: decreased effects of felodipine
Nisoldipine, ranolazine: do not use concurrently
PHENobarbital, valproic acid, verapamil: decreased OXcarbazepine level
Phenytoin: decreased OXcarbazepine level

### Drug classifications

Contraceptives (oral): decreased oral contraceptive level
MAOIs: do not use concurrently

### Drug/herb

Ginkgo: increased anticonvulsant effect
Ginseng, santonica: decreased anticonvulsant effect

### Drug/lab test

Decreased: sodium

## NURSING CONSIDERATIONS

### Assessment

- **Assess seizure activity,** including frequency, duration, and aura; provide seizure precautions
- Assess mental status including mood, sensorium, affect, behavioral changes, suicidal thoughts, behavior; if mental status changes, notify prescriber; usually occurs within the first 3 mo of treatment, but may occur ≤1 yr; if this product is being used with other products that decrease sodium, monitor sodium levels
- Assess eye problems: ophthalmic examinations (slit lamp, funduscopy, tonometry) are needed before, during, after treatment
- Assess patient for hypersensitivity to carBAMazepine

- **Assess for serious skin reactions:** angioedema, anaphylaxis, Stevens-Johnson syndrome
- **Pregnancy:** lack of seizure control due to MHD, a metabolite of OXcarbazepine; monitor seizure control, pregnant patients should enroll in Antiepileptic Drug Pregnancy Registry 888-233-2334, do not breastfeed, excreted in breast milk
- May monitor target serum level 12-30 mcg/ml to identify compliance/toxicity
- **Beers:** Avoid in older adults unless safer alternatives are not available, ataxia, impaired psychomotor function may occur

### Patient/family education

- Caution patient to avoid driving, other activities that require alertness
- Instruct patient to take twice a day at same intervals (immediate release)
- Advise patient not to discontinue medication quickly after long-term use, seizures may increase
- Instruct patient to avoid use of alcohol while taking this medication
- Instruct patient to use alternative contraception if using hormonal method, to report if pregnancy is planned or suspected, pregnancy
- Teach patient to report skin rashes immediately; serious skin reactions can occur
- Instruct patient to inform prescriber if allergic to carBAMazepine; multisystem hypersensitivity may occur, to report fever, other allergic symptoms
- Instruct patient to report suicidal thoughts/behavior immediately

### Evaluation

**Positive therapeutic outcome**

- Decreased seizure activity

## TREATMENT OF OVERDOSE:

Give 0.9% NaCl (hypotensive state), atropine (bradycardia); use benzodiazepines, barbiturates for seizures

## oxybutynin (Rx, OTC)

(ox-i-byoo'ti-nin)

**Ditropan, Ditropan XL, Gelnique, Oxytrol ✱, Uromax ✱ Oxybutynin (Transdermal) Oxytrol, Oxytrol for women**

*Func. class.:* Anticholinergic, urinary antispasmatic

*Chem. class.:* Synthetic tertiary amine

**Do not confuse:** Ditropan/diazepam/diprivan

## ACTION:

Relaxes smooth muscles in urinary tract by inhibiting acetylcholine at postganglionic sites

**Therapeutic outcome:** Decreased symptoms of urgency, nocturia, incontinence

## USES:

Antispasmodic for neurogenic bladder, overactive bladder in females (OTC)

## CONTRAINDICATIONS

Hypersensitivity, GI obstruction, urinary retention, glaucoma, severe colitis, myasthenia gravis, unstable CV, infants

**Precautions:** Pregnancy, breastfeeding, children <12 yr, geriatric, suspected glaucoma, cardiac disease, dementia

## DOSAGE AND ROUTES

**Adult:** PO 5 mg bid-tid, max 5 mg qid; ext rel tabs 5-10 mg/day, may increase by 5 mg, max 30 mg/day; transdermal apply one patch to abdomen, hip, buttock 2 ×/wk (q3-4day); GEL apply contents of 1 packet to abdomen, upper arms, shoulders, thighs daily

**Geriatric:** PO 2.5-5 mg bid-tid, increase by 2.5 mg q several days

**Child ≥6 yr:** PO 5 mg bid, not to exceed 5 mg tid; ext rel 5 mg/day, max 20 mg/day

**Child 1-5 yr:** PO 0.2 mg/kg/dose 2-3 ×/day

**Available forms:** Syr 5 mg/5 ml; tabs 5 mg; ext rel tabs 5, 10, 15 mg; transdermal 3.9 mg/day; top gel 10% (Gelnique)

### Implementation

**PO route**

- Do not break, crush, or chew ext rel tabs
- May be given with meals or fluids or on an empty stomach

**Topical route**

- Wash hands, apply to clean, dry, intact skin on abdomen, upper arms/shoulders, thighs, avoid navel, rotate sites
- Squeeze contents in palm of hand or directly on this site, rub gently
- Do not bathe, exercise, swim for 1 hr after application
- Allow to dry before putting on clothing
- Do not be near flame, fire, or smoke until gel has dried
- Delivers 100 mg

**Transdermal route**

- Apply to clean, dry, intact skin on the abdomen, hip, buttock, use firm pressure, not affected by showering/bathing; rotate sites
- Delivers 3.9 mg/day

## ADVERSE EFFECTS

**CNS:** *Anxiety, restlessness, dizziness,* somnolence, insomnia, nervousness, seizures, headache, drowsiness, confusion
**CV:** *Palpitations, sinus tachycardia,* hypertension, peripheral edema, QT prolongation
**EENT:** Blurred vision, increased intraocular tension; dry mouth, throat, dry eyes
**GI:** *Nausea, vomiting, anorexia,* abdominal pain, constipation, *dyspepsia,* diarrhea, taste perversion, GERD
**GU:** Dysuria, impotence, retention, hesitancy
**MISC:** Hyperthermia, anaphylaxis, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Unknown |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ½-1 hr |
| **Peak** | 3-4 hr |
| **Duration** | 6-10 hr |

## INTERACTIONS

### Individual drugs

Acetaminophen: decreased levels of acetaminophen
Amantadine: increased anticholinergic effects
Atenolol: increased levels of atenolol
Digoxin: increased levels of digoxin
Haloperidol, chloroquine, droperidol, pentamidine, arsenic trioxide, levomethadyl: increased QT prolongation
Levodopa: decreased levels of levodopa
Nitrofurantoin: increased levels of nitrofurantoin

### Drug classifications

Antihistamines, other anticholinergics: increased anticholinergic effects
Benzodiazepines, sedatives, hypnotics, opioids: increased CNS depression
Class IA/III antidysrhythmics, some phenothiazines, β-agonists, local anesthetics, tricyclics, CYP3A4 inhibitors (amiodarone, clarithromycin, erythromycin, telithromycin, troleandomycin), CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone): increased QT prolongation

## NURSING CONSIDERATIONS

### Assessment

- **Assess for allergic reactions:** rash, urticaria; if these occur, product should be discontinued, swelling of face, tongue, throat
- **Assess urinary patterns:** distention, nocturia, frequency, urgency, incontinence; catheterization may be required to remove residual urine; urinary tract infections should be treated
- **QT prolongation:** assess ECG for QT prolongation, ejection fraction; assess for chest pain, palpitations, dyspnea
- **Pregnancy/breastfeeding:** Use only if benefits outweigh risks, cautious use in breastfeeding, excretion unknown
- **Beers:** Avoid in older adults, delirium risk is increased

### Patient/family education

- Advise patient to avoid hazardous activities until response to product is known; dizziness, blurred vision may occur
- Caution patient to avoid OTC medication with alcohol or other CNS depressants
- Teach patient to use frequent rinsing of mouth, sips of water for dry mouth
- Teach patient to stay cool; avoid hot weather, strenuous activity since overheating may occur; product decreases perspiration
- Advise patient to report CNS effects: confusion, anxiety, anticholinergic effect in the geriatric

**Transdermal**

- Instruct patient to change patch 2×/wk and not to use same site within 7 days
- Instruct patient to use container that is not accessible to pets/children and to dispose of container after use
- Instruct patient to open patch immediately before using
- Instruct patient to remove patch during MRI

**Topical gel**

- **Instruct patient to rotate sites**
- Instruct patient to apply to clean, dry skin on abdomen, upper arm/shoulders/thighs
- Teach patient that gel is flammable

### Evaluation

**Positive therapeutic outcome**

- Absence of dysuria, frequency, nocturia, incontinence

**⚠ HIGH ALERT—REMS**

## oxyCODONE (Rx)

(ox-i-koe′done)

**Oyado, Oxecta, OxyCONTIN, Oxy IR 🍁, Supeudol, Xampza 🍁**

## oxyCODONE/acetaminophen (Rx)

**Percocet, Roxicet, Xartemis XR**

## oxyCODONE/aspirin (Rx)

**Endodan 🍁, Percodan**

## oxyCODONE/ibuprofen (Rx)

*Func. class.:* Opiate analgesic

*Chem. class.:* Semisynthetic derivative

**Controlled substance schedule II**

**Do not confuse:** oxyCODONE/HYDROcodone/OxyCONTIN

**ACTION:** Inhibits ascending pain pathways in CNS, increases pain threshold, alters pain perception

**Therapeutic outcome:** Decreased pain

**USES:** Moderate to severe pain

**Unlabeled uses:** Postherpetic neuralgia (cont rel)

## CONTRAINDICATIONS

Hypersensitivity, addiction (opiate), asthma, ileus

**BLACK BOX WARNING:** Respiratory depression

**Precautions:** Pregnancy, breastfeeding, children <18 yr, addictive personality, increased ICP, MI (acute), severe heart disease, renal/hepatic disease, bowel impaction

**BLACK BOX WARNING:** Opioid-naïve patients, substance abuse, accidental exposure, potential for overdose/poisoning, status asthmaticus

## DOSAGE AND ROUTES

### Severe pain

**Adult:** PO 10-30 mg q4hr (5-15 mg q4-6hr for opiate naive patients); OxyFast CONC SOL is extremely concentrated, do not use interchangeably; CONT REL 10 mg q12hr in opiate-naïve patients

**Child >5 yr and adolescent (unlabeled):** PO 0.2 mg/kg given 30 min before procedure

**Available forms: OxyCODONE:** cont rel tabs (OxyCONTIN) 10, 15, 20, 30, 40, 80, 160 mg; immediate rel tabs 5, 7.5, 10, 15, 20, 30 mg; immediate rel caps 5 mg; oral sol 5 mg/5 ml, 20 mg/ml; Ext rel cap 13.5, 18, 27, 36 mg **oxyCODONE with acetaminophen:** 2.5 mg/325 mg, 5 mg/325 mg; 7.5 mg/325 mg, 7.5 mg/500 mg, 10 mg/325 mg; oral sol 5 mg/325 mg/5 ml; **oxyCODONE with aspirin:** 4.835 mg/325 mg; **oxyCODONE with ibuprofen:** 5 mg/400 mg

### Implementation

- Clarify all orders, fatalities have occurred
- Regular administration is more effective than PRN, give before pain becomes severe
- Discontinue gradually after long-term use
- OxyCODONE should be titrated from the initial recommended dosage to the dose required to relieve pain
- There is no maximum dose of oxyCODONE; however, careful titration is required until tolerance develops to some of the side effects (drowsiness and respiratory depression)
- Store in light-resistant area at room temp

**Immediate-release tablets**

- May be administered with food or milk to minimize GI irritation
- Oxecta brand tablets: Swallow whole; do not crush or dissolve. Due to the nature of this formulation do not presoak, lick, or otherwise wet tablet prior to dose administration. Administer 1 tablet at a time; allow patient to swallow each tablet separately with sufficient liquid to ensure prompt and complete transit through the esophagus. Do not use this brand for administration via nasogastric, gastric, or other feeding tubes as it may cause obstruction of feeding tubes

**Oxycodone extended-release caps (Xtampza ER) administration**

- Take with food and with approximately the same amount of food in order to ensure consistent plasma concentrations
- The capsule contents may be sprinkled onto soft foods (applesauce, pudding, yogurt, ice cream, or jam) or into a cup and then given directly into the mouth; swallow immediately and rinse mouth to ensure all contents have been swallowed. Discard capsule shells after administration
- The capsule contents may be given through an NG or gastrostomy tube. Flush the tube with water. Open a capsule and pour the contents directly into the tube. Do not premix capsule contents with the liquid that will be used to flush the tube. Draw up 15 ml of water into a syringe, insert the syringe into the tube, and flush the contents through the tube. Repeat flushing twice using 10 ml of water with each flush. Milk or liquid nutritional supplement may be used as

O

an alternative to water when flushing capsule contents through the tube
• Extended-release 36-mg capsules are for use ONLY in opioid-tolerant patients
• Monitor patients closely for respiratory depression, particularly within the first 24 to 72 hr after initiation or dose escalation

**Controlled-release tablets (OxyCONTIN)**
• Administer whole; do not crush, chew, or break in half. Taking chewed, broken, or crushed controlled-release tabs could lead to the rapid release and absorption of a potentially toxic dose of oxyCODONE
• OxyCONTIN brand tablets: Due to hydrogelling nature of the 2010 reformulation, do not presoak, lick, or otherwise wet tab prior to dose administration. Administer 1 tab at a time; allow patient to swallow each tab separately with sufficient liquid to ensure prompt and complete transit through the esophagus
• OxyCODONE controlled-release (OxyCONTIN) 60 mg and 80 mg tablets are for use ONLY in opioid-tolerant patients
• May be administered with or without food

**Oral concentrate solution route**
• As OxyFast is a highly concentrated solution (20 mg oxyCODONE/ml), care should be taken in dispensing and administering this medication. For ease of administration, the solution may be added to 30 ml of a liquid or semisolid food. If the medication is placed in liquid or food, the patient needs to consume immediately; do not store diluted oxyCODONE for future use

**PO route**
• Do not break, crush, or chew cont rel tabs; give q12hr, no more frequently
• May be given with food or milk to lessen GI upset
• Use 80, 160 mg cont rel tabs (oxyCONTIN) only in opioid-tolerant patients

## ADVERSE EFFECTS

**CNS:** *Drowsiness, dizziness, confusion, headache, sedation, euphoria,* fatigue, abnormal dreams, thoughts, hallucinations
**CV:** Palpitations, bradycardia, change in B/P
**EENT:** Tinnitus, blurred vision, miosis, diplopia
**GI:** *Nausea, vomiting, anorexia, constipation, cramps,* gastritis, dyspepsia, biliary spasms
**GU:** Increased urinary output, dysuria, urinary retention
**INTEG:** *Rash,* urticaria, bruising, flushing, diaphoresis, pruritus
**RESP:** Respiratory depression

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed; crosses placenta, protein binding 45% |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 3-5 hr |

### Pharmacodynamics

| | PO | RECT |
|---|---|---|
| **Onset** | 15-30 min | Unknown |
| **Peak** | ½-1 hr | Unknown |
| **Duration** | Reg rel 2-6 hr, cont rel 12 hr | 4-6 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased respiratory depression, hypotension, sedation
Cimetidine: increased toxicity

### Drug classifications

Antipsychotics, CNS depressants, opioids, sedative/hypnotics, skeletal muscle relaxants: increased respiratory depression, hypotension
CYP3A4 inhibitors: increased oxyCODONE level
MAOIs: increased toxicity

### Drug/herb

St. John's wort, valerian: increased sedative effect

### Drug/lab test

Increased: amylase, lipase

## NURSING CONSIDERATIONS

### Assessment

• **Pain:** assess intensity, location, type, characteristics; need for pain medication by pain/sedation scoring; physical dependence
• Monitor I&O ratio; check for decreasing output; may indicate urinary retention
• **CNS changes:** assess for dizziness, drowsiness, hallucinations, euphoria, LOC, pupil reaction
• **Allergic reactions:** assess for rash, urticaria

**BLACK BOX WARNING: Respiratory dysfunction:** assess for respiratory depression, character, rate, rhythm; notify prescriber if respirations are <10/min; also B/P, pulse take baseline and periodically

• **Bowel status:** assess for constipation; stimulate laxative may be needed with fluids, fiber
• Monitor VS after parenteral route; note muscle rigidity, product history, renal, liver function tests, respiratory dysfunction: respiratory depression, character, rate, rhythm; notify prescriber if respirations are <10/min

**BLACK BOX WARNING: Substance abuse:** assess for substance abuse in patient/family/friends before prescribing; monitor for abuse, may crush, chew, snort, or inject ex rel product, may be fatal

**BLACK BOX WARNING: Accidental exposure:** dispose of properly away from pets, children

**BLACK BOX WARNING:** Pregnancy/breast-feeding: Use only if benefits outweigh fetal risk, neonatal opioid withdrawal syndrome may occur with extended user, avoid breast-feeding, excreted in breast milk

• **Beers:** Avoid in older adults, ataxia, impaired psychomotor function may occur

### Patient/family education

• Advise patients to avoid CNS depressants: alcohol, sedative/hypnotics
• Discuss with patient that dizziness, drowsiness, and confusion are common; to avoid getting up without assistance
• Discuss in detail all aspects of the product, including purpose and what to expect
• Advise patient to make position changes slowly to lessen orthostatic hypotension
• Advise patient to avoid CNS depressants, alcohol
• Advise patient to avoid operating machinery, driving if drowsiness occurs
• Teach patient that withdrawal symptoms may occur after long-term use: nausea, vomiting, cramps, fever, faintness, anorexia

### Evaluation

**Positive therapeutic outcome**
• Decreased pain

## TREATMENT OF OVERDOSE:

Naloxone 0.2-0.8 **IV,** $O_2$, **IV** fluids, vasopressors; caution with patients physically dependent on opioids

**⚠ HIGH ALERT**

**RARELY USED**

## oxycodone/naltrexone

(ox-i-koe'done/nal-trex'one)

**Troxyca ER**

*Func. class.:* Analgesic combination, opioid

**Controlled Substance Schedule II**

**USES:** For use as the first opioid analgesic in patients who are not opioid tolerant, for conversion from tramadol, for conversion from buprenorphine transdermal patch, for conversion from other oral oxycodone formulations, for conversion from the fentanyl patch, for conversion from other opioid analgesics

## CONTRAINDICATIONS

Hypersensitivity, GI obstruction, ileus, status asthmaticus

**BLACK BOX WARNING:** Respiratory depression

## DOSAGE AND ROUTES

This product should be reserved for those in which nonopioid analgesics or immediate-release opioids are ineffective or not tolerated. Discontinue all other around-the-clock opioid drugs upon initiation of oxycodone/naltrexone

Oxycodone/naltrexone 60 mg/7.2 mg and 80 mg/9.6 mg capsules, a single dose >40 mg/4.8 mg, or a total daily dose >80 mg/9.6 mg are for use in opioid-tolerant patients only

### For use as the first opioid analgesic in patients who are not opioid tolerant, conversion from tramadol, or conversion from buprenorphine transdermal patch

**Adult:** PO 10 mg/1.2 mg PO q12hr. Titrate dose by 20 mg/2.4 mg as needed q2-3 days. To discontinue, gradually taper the dose by 25%-50% q2-4 days

### For conversion from other oral oxycodone formulations

**Adult:** PO Convert to an equivalent total daily oxycodone dose and divide the 24-hour oxycodone requirements into 2 equal doses given q12hr. Titrate dose by 20 mg/2.4 mg as appropriate q2-3 days. To discontinue, gradually taper the dose by 25%-50% q2-4 days

### For conversion from the fentanyl patch

**Adult:** PO 10 mg/1.2 mg q12hr for each 25 mcg/hour fentanyl transdermal patch beginning 18 hr after removal of the fentanyl transdermal patch. Titrate dose by 20 mg/2.4 mg as needed q2-3 days. To discontinue, gradually taper the dose by 25%-50% q2-4 days

### For conversion from other opioid analgesics

**Adult:** Calculate the total daily dose of the opioid and multiply it by the appropriate conversion factor to calculate the total daily oxycodone dose. For patients on more than 1 opioid, calculate the total daily oral oxycodone dose for each opioid and sum the totals. For patients using opioid/nonopioid combination analgesics, use only the opioid component for calculation. Reduce the

O

estimated oxycodone dose by 50% to obtain the total daily dose of oxycodone/naltrexone. Divide the dose and give PO q12 hr. If necessary, always round down to the appropriate capsule strength available. If the total daily oxycodone requirement is 20 mg per day or less, initiate therapy with 10 mg/1.2 mg PO q12hr. Provide immediate-release rescue medication as needed. Titrate dose by 20 mg/2.4 mg as needed q2-3 days. Use extreme caution when converting patients from methadone as the ratio between methadone and other opioid analgesics can vary widely. To discontinue, gradually taper the dose by 25%-50% q2-4 days

## oxymetazoline nasal agent

*See Appendix B*

## oxymetazoline ophthalmic

*See Appendix B*

**⚠ HIGH ALERT—REMS**

## oxymorphone (Rx)

(ox-i-mor′fone)

**Opana, Numorphan**

*Func. class.:* Opiate analgesic

*Chem. class.:* Semisynthetic phenanthrene derivative

**Controlled substance schedule II**

**Do not confuse:** oxymorphone/oxyCODONE

**ACTION:** Depresses pain impulse transmission at the spinal cord level by interacting with opioid receptors, increases pain threshold, alters pain perception

**Therapeutic outcome:** Decreased pain

**USES:** Moderate to severe pain

### CONTRAINDICATIONS

Hypersensitivity, addiction (opioid), asthma, hepatic disease, ileus, intrathecal use, surgery

**BLACK BOX WARNING:** Respiratory depression

**Precautions:** Pregnancy (short-term), breastfeeding, children <18 yr, addictive personality, increased ICP, MI (acute), severe heart disease, respiratory depression, renal/hepatic disease, bowel impaction

**BLACK BOX WARNING:** Alcoholism, opioid-naïve patients, substance abuse

### DOSAGE AND ROUTES

**Adult:** IM/SUBCUT 1 mg q4-6hr prn; **IV** 0.5 mg q4-6hr prn; PO (immediate release only) 5-20 mg q4-6hr prn; PO-ER 5 mg q12hr in those requiring around the clock dosing

#### Labor analgesia

**Adult:** IM 0.5-1 mg

#### Hepatic dose:

**Adult:** Mild hepatic disease PO (ext rel) 5 mg q12hr (opioid naive) or 2.5 mg q12hr those on prior opiate therapy

#### Renal dose

**Adult:** PO (ext rel) 5 mg q12hr (opioid naive) or 2.5 mg q12hr those with prior opiate therapy

**Available forms:** Inj 1 mg/ml; supp 5 mg; ER tab, crush resistant 5, 7.5, 10, 15, 20, 30, 40 mg; tabs 5, 10 mg

#### Implementation

- Give 1 hr before or 2 hr after food (PO)
- Give with antiemetic if nausea, vomiting occur
- Do not break, crush, chew ER product
- Give when pain is beginning to return; determine dosage interval by patient response; continuous dosing of medication is more effective than when given prn
- Medication should be slowly withdrawn after long-term use to prevent withdrawal symptoms
- Store in light-resistant area at room temp

**Direct IV route**

- Give undiluted over 2-3 min, may be diluted in normal saline solution

### ADVERSE EFFECTS

**CNS:** *Drowsiness, dizziness, confusion, headache, sedation, euphoria (geriatric),* seizures, hallucinations, increased ICP

**CV:** Palpitations, bradycardia, change in B/P, hypotension

**EENT:** Tinnitus, blurred vision, miosis, diplopia

**GI:** *Nausea, vomiting, anorexia, constipation, cramps*

**GU:** Dysuria, urinary retention

**INTEG:** *Rash,* urticaria, bruising, flushing, diaphoresis, pruritus

**RESP:** Respiratory depression

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (RECT, IM, SUBCUT); completely absorbed (**IV**) |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys |
| **Half-life** | PO: 7-9 hr, |

### Pharmacodynamics

| | IM/ SUBCUT | IV | RECT |
|---|---|---|---|
| **Onset** | 15 min | 10 min | 30 min |
| **Peak** | 1-1½ hr | 15-30 min | Unknown |
| **Duration** | 3-6 hr | 3-4 hr | 3-6 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased respiratory depression, hypotension, sedation

### Drug classifications

CNS depressants, opiates, antipsychotics, skeletal muscle relaxants, sedative/hypnotics: increased respiratory depression, hypotension

MAOIs: do not use 2 wk before oxymorphone; unpredictable effects

### Drug/herb

Kava, St. John's wort, valerian: increased sedative effect

### Drug/lab test

Increased: amylase

## NURSING CONSIDERATIONS

### Assessment

• **Pain:** assess location, intensity, type, other characteristics, before and 1 hr after (IM) IV 30 min; need for pain medication, physical dependence, give 25%-50% until there is pain reduction of 50% on pain rating scale, repeat dose may be given at time of peak, if previous dose does not control pain, and respiratory depression has not occurred; give short-acting opioids for breakthrough pain if on controlled rel product

**BLACK BOX WARNING: Respiratory dysfunction:** Assess for respiratory depression, character, rate, rhythm; notify prescriber if respirations are <10/min, dose may need to be decreased by 25%-50%, monitor B/P, pulse also

**BLACK BOX WARNING: Accidental exposure:** Dispose of properly, away from children/pets

**BLACK BOX WARNING: Overdose/poisoning:** Avoid alcohol ingestion; do not crush, chew, snort, or inject tabs, high abuse potential

**BLACK BOX WARNING: Opioid-naive patients:** Ext rel tabs are not to be used immediately post-op (12-24 hr after surgery) in these patients

• **Assess bowel/bladder status:** constipation, may need stimulant laxative; if use ≥ 3 days I&O ratio for decreasing output, may indicate urinary retention

• Monitor VS after parenteral route; note muscle rigidity, product history, liver, kidney function tests

• Monitor CNS changes: dizziness, drowsiness, hallucinations, euphoria, LOC, pupil reaction

• Monitor allergic reactions: rash, urticaria

**BLACK BOX WARNING:** Pregnancy/breastfeeding: Use only if benefits outweigh fetal risk, neonatal opioid withdrawal syndrome may occur with extended use, avoid breastfeeding

### Patient/family education

• **Advise patient not to use other CNS depressants:** alcohol, sedative/hypnotics

• Discuss with patient that dizziness, drowsiness, and confusion are common; to avoid getting up without assistance

• Discuss in detail all aspects of the product, including purpose and what to expect

• Advise patient to make position changes slowly to lessen orthostatic hypotension

• Advise patient not to drive, operate machinery if drowsiness occurs

• Teach patient to notify health care professional if pregnancy is planned or suspected, not to breastfeed

• Teach patient to notify all prescribers of all OTX, Rx, herbs, supplements being taken, not to take new products unless approved by prescriber

• Teach patient that OxyCONTINtabs may appear in stool

### Evaluation

**Positive therapeutic outcome**

• Decreased pain

## TREATMENT OF OVERDOSE:

Naloxone (Narcan) 0.2-0.8 mg **IV,** $O_2$, **IV** fluids, vasopressors (caution with patients physically dependent on opioids)

O

**⚠ HIGH ALERT**

# oxytocin (Rx)

(ox-i-toe′sin)

**Pitocin, syntocinon**

*Func. class.:* Oxytocic hormone

**ACTION:** Acts directly on myofibrils, producing uterine contraction; stimulates breast milk letdown, vasoactive antidiuretic effect

**Therapeutic outcome:** Stimulation of labor, control of bleeding; stimulation of milk letdown

**USES:** Stimulation, induction of labor; missed or incomplete abortion; postpartum bleeding

## CONTRAINDICATIONS

Hypersensitivity, serum toxemia, cephalopelvic disproportion, fetal distress, hypertonic uterus, prolapsed umbilical cord, active genital herpes

**Precautions:** Cervical/uterine surgery, uterine sepsis, primipara >35 yr, 1st/2nd stage of labor

**BLACK BOX WARNING:** Elective induction of labor

## DOSAGE AND ROUTES

### Labor induction

**Adult: IV** 1-2 milliunit/min, increase by 1-2 milliunit q15-60min until regular contractions occur, then decrease dosage

### Postpartum hemorrhage

**Adult: IV** 10-40 units in 1000 ml nonhydrating diluent infused at 20-40 milliunit/min

**Adult:** IM 3-10 units after placenta delivery

### Incomplete abortion

**Adult: IV** INF 10 units/500 ml $D_5W$ or 0.9% NaCl run at 10-20 milliunit/min; max 30 units/12 hr

### Fetal stress test

**Adult: IV** 0.5 milliunit/min; increase q20min until 3 contractions occur at 10 min

**Available forms:** Inj 10 units/ml

### Implementation

**Oxytocin administration**

- Give by IV infusion or IM
- Before use, an IV infusion of NS should be already running for use in case of adverse reactions. Magnesium sulfate should be readily available if relaxation of the myometrium is needed
- Visually inspect parenteral product for particulate matter and discoloration before use

**IV infusion route**

- ***Induction of labor:*** Dilute 1 ml (10 units) in 1000 ml of a compatible IV infusion solution. Rotate infusion bottle for thorough mixing. The resultant infusion should contain 10 milliunits/ml
- ***Control of postpartum uterine bleeding:*** Dilute 10-40 units in a compatible IV solution or to an already infusing solution. The maximum concentration is 40 units in 1000 ml of solution
- ***Incomplete, inevitable, or elective abortion:*** Dilute 10 units in 500 ml of a compatible IV solution
- Administer using an infusion pump to ensure accurate dosing

**IM route**

- Inject into a large muscle mass, aspirate before injection to avoid injection into a blood vessel

**Y-site compatibilities:** acyclovir, alfentanil, allopurinol, amikacin, aminocaproic acid, aminophylline, amphotericin B liposome (AmBisome), anidulafungin, argatroban, ascorbic acid injection, atenolol, atracurium, atropine, azaTHIOprine, azithromycin, aztreonam, benztropine, bivalirudin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, capreomycin, caspofungin, cefamandole, ceFAZolin, cefepime, cefoperazone, cefotaxime, cefotetan, cefoxitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorothiazide, chlorpheniramine, cimetidine, ciprofloxacin, cisatracurium, clindamycin, cloxacillin, colistimethate, cyanocobalamin, cyclophosphamide, cycloSPORINE, DAPTOmycin, dexamethasone, dexmedetomidine, digoxin, dilTIAZem, diphenhydramine, dobutamine, dolasetron, dopamine, doxycycline, droperidol, edetate calcium disodium, enalaprilat, ePHEDrine, EPINEPHrine, epoetin alfa, eptifibatide, ergonovine, ertapenem, erythromycin, esmolol, famotidine, fenoldopam, fentaNYL, fluconazole, folic acid (as sodium salt), foscarnet, fosphenytoin, furosemide, gallamine, ganciclovir, gatifloxacin, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone sodium succinate, HYDROmorphone, hydrOXYzine, imipenem-cilastatin, isoproterenol, kanamycin, ketamine, ketorolac, labetalol, lactated Ringer's injection, lansoprazole, lepirudin, leucovorin, levoFLOXacin, lidocaine, lincomycin, linezolid, lorazepam, magnesium sulfate, mannitol, mechlorethamine, meperidine, mephentermine, meropenem, metaraminol, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metronidazole, midazolam, milrinone, minocycline, morphine, moxifloxacin, multiple vitamins injection, mycophenolate mofetil, Nafcillin, nalbuphine, nalorphine, naloxone, nesiritide, netilmicin, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, ondansetron, oxacillin,

palonosetron, pamidronate, papaverine, penicillin G potassium/sodium, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, phytonadione, piperacillin sodium, piperacillin -tazobactam, polymyxin B, potassium acetate/chloride/phosphates, procainamide, prochlorperazine, prochlorperazine, promazine, promethazine, propranolol, protamine, pyridoxine, quinupristin-dalfopristin, raNITIdine, Ringer's injection, sodium acetate/bicarbonate/phosphates, streptomycin, succinylcholine, SUFentanil, tacrolimus, theophylline, thiamine hydrochloride, ticarcillin disodium, ticarcillin disodium-clavulanate potassium, tigecycline, tirofiban hydrochloride, tobramycin sulfate, tolazoline, trimetaphan, tubocurarine, urokinase, vancomycin, vasopressin, verapamil, vitamin B complex with C, voriconazole, warfarin, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CNS:** Seizures, tetanic contractions
**CV:** Hypo/hypertension, dysrhythmias, increased pulse, bradycardia, tachycardia, premature ventricular contractions
**FETUS:** Dysrhythmias, jaundice, hypoxia, intracranial hemorrhage
**GI:** Anorexia, nausea, vomiting, constipation
**GU:** Abruptio placentae, decreased uterine blood flow
**HEMA:** Increased hyperbilirubinemia
**INTEG:** Rash
**RESP:** Asphyxia
**SYST:** Water intoxication of mother

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (nasal); completely absorbed (**IV**) |
| **Distribution** | Widely distributed (extracellular fluid) |
| **Metabolism** | Liver, rapidly |
| **Excretion** | Kidneys |
| **Half-life** | 3-12 min |

### Pharmacodynamics

| | Nasal | IV | IM |
|---|---|---|---|
| **Onset** | 5 min | Rapid | 3-7 min |
| **Peak** | Unknown | Unknown | Unknown |
| **Duration** | 20 min | 1 hr | 1 hr |

## INTERACTIONS

### Drug classifications

Vasopressors: Increase: increased hypertension

### Drug/herb

Ephedra: Increase: hypertension

## NURSING CONSIDERATIONS

### Assessment

- **Assess labor contractions:** fetal heart tones, frequency, duration, intensity of contractions; if fetal heart tones increase or decrease significantly or if contractions are longer than 1 min, notify prescriber; turn patient on left side to increase oxygen to fetus
- **Assess for water intoxication:** confusion, anuria, drowsiness, headache; monitor I&O notify prescriber
- Watch for fetal distress, acceleration, deceleration, fetal presentation, pelvic dimensions
- Monitor B/P, pulse, respiratory rate, rhythm, depth
- Assess for fetal presentation, pelvic dimensions before use
- Provide an environment conducive to letdown reflex
- Monitor continuously, discontinue immediately if fetal distress occurs or uterine hyperactivity occurs

### Patient/family education

- Teach patient to report increased blood loss, abdominal cramps, increased temp or foul-smelling lochia, nausea, blurred vision, itching, swelling
- Advise patient that contractions will be similar to menstrual cramps, gradually increasing in intensity

**BLACK BOX WARNING:** Elective induction of labor; use only for induction when medically necessary

### Evaluation

**Positive therapeutic outcome**

- Stimulation of milk letdown (nasal)
- Induction of labor
- Decreased postpartum bleeding

O

obinutuzumab
OLANZapine (Rx)
olmesartan (Rx)
omalizumab (Rx)
oritavancin
oxazepam (Rx)
oxyCODONE (Rx)
oxyCODONE/ibuprofen (Rx)
oxymetazoline ophthalmic
octreotide (Rx)
olaparib
olopatadine ophthalmic
omeprazole (Rx, OTC)
oseltamivir (Rx)
OXcarbazepine (Rx)
oxyCODONE/acetaminophen (Rx)
oxycodone/naltrexone
oxymorphone (Rx)
ofloxacin ophthalmic
olaratumab
olsalazine (Rx)
ondansetron (Rx)
oxaliplatin (Rx)
oxybutynin (Rx, OTC)
oxyCODONE/aspirin (Rx)
oxymetazoline nasal agent
oxytocin (Rx)

**⚠ HIGH ALERT**

# PACLitaxel (Rx)

(pa-kli-tax′el)

**Taxol**

# PACLitaxel protein-bound particles (Rx)

**Abraxane**

*Func. class.:* Antineoplastic—miscellaneous

*Chem. class.:* Taxane

**Do not confuse:** PACLitaxel/PARoxetine/Paxil

**ACTION:** Inhibits the reorganization of the microtubule network needed for interphase and mitotic cellular functions; also causes abnormal bundles of microtubules during cell cycle and multiple esters of microtubules during mitosis

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** PACLitaxel metastatic carcinoma of the ovary, breast carcinoma, AIDS-related Kaposi's sarcoma (second line), non–small cell lung cancer (first line), adjuvant treatment for node-positive breast cancer, prostate, esophageal cancer, melanoma

**Unlabeled uses:** Advanced head, neck, small cell lung cancer; non-Hodgkin's lymphoma, adenocarcinoma of the upper GI tract, hormone-refractory prostate cancer

## CONTRAINDICATIONS

Pregnancy, hypersensitivity to paclitaxel or other products with polyoxyethylated castor oil, albumin

**BLACK BOX WARNING:** Neutropenia (neutrophils $<1500/mm^3$)

**Precautions:** Breastfeeding, children, CV/hepatic disease, CNS disorder, renal disease, bone marrow suppression, dental disease/work, extravasation, females, geriatric patients, herpes, infection, infertility, jaundice, ocular exposure, radiation therapy, thrombocytopenia, vaccination

**BLACK BOX WARNING:** Taxane hypersensitivity, requires a specialized care setting and an experienced clinician, bone marrow supression

## DOSAGE AND ROUTES

### >> PACLitaxel

#### Ovarian carcinoma

**Adult: IV** INF 135 mg/$m^2$ given over 24 hr q3wk, then CISplatin 75 mg/$m^2$ or 175 mg/$m^2$ over 3 hr q3wk (refractory or metastatic) or 175 mg/$m^2$ over 3 hr

#### Advanced ovarian carcinoma

**Adult: IV** INF 175 mg/$m^2$ with CISplatin 75 mg/$m^2$ over 3 hr q3wk

#### Breast carcinoma

**Adult: IV** INF 175 mg/$m^2$ over 3 hr q3wk × 4 courses

#### AIDS-related Kaposi's sarcoma

**Adult: IV** INF 135 mg/$m^2$ over 3 hr q3wk or 100 mg/$m^2$ over 3 hr q2wk

#### 1st line non–small cell lung cancer

**Adult: IV** INF 135 mg/$m^2$/24 hr with CISplatin 75 mg/$m^2$ × 3 wk

### >> PACLitaxel protein-bound particles

#### Breast cancer

#### Pancreatic cancer

**Adult:** IV 125 mg/m2 over 30-40 min on Day 1, 8, 15 of each 28-day cycle

**Adult: IV** 260 mg/$m^2$ q3wk

#### Hepatic dose

Adult, for dose reduction 135 mg/$m^2$ 24 hr IV inf: AST/ALT 2-10 × ULN, total bilirubin ≤1.5 mg/dl: give 100 mg/$m^2$; AST/ALT <10 × ULN, total bilirubin 1.6-7.5 mg/dl: give 50 mg/$m^2$; AST/ALT ≥10 × ULN or total bilirubin >7.5 mg/dl: avoid use

Adult, for dose reduction 175 mg/$m^2$ 3 hr IV inf: AST/ALT <10 × ULN, total bilirubin 1.26-2 × ULN: 135 mg/$m^2$; AST/ALT <10 × ULN, total bilirubin 2.01-5 × ULN: give 90 mg/$m^2$; AST/ALT ≥10 × ULN or total bilirubin >5 × ULN: avoid use

**Available forms:** Inj 6 mg/ml, 30 mg/5-ml vial, 100 mg/16.7-ml vial, 150 mg/25-ml vial, 300 mg/50-ml vials; powder for inj, lyophilized 100 mg in single-use vials (Abraxane)

### Implementation

**BLACK BOX WARNING: Bone marrow suppression** Monitor CBC, differential, platelet count weekly; withhold product if WBC is $<1500/mm^3$ or platelet count is $<100,000/mm^3$, notify prescriber of results

- If CISplatin is given, use after taxane

**Continuous IV INF route**

- After premedicating with dexamethasone 20 mg PO 12 hr and 6 hr before paclitaxel, diphenhydrAMINE 50 mg IV ½-1 hr before PACLitaxel and cimetidine 300 mg or ranitidine 50 mg IV ½-1 hr before PACLitaxel
- For extravasation if given by regular IV, not port

## >> PACLitaxel

### Breast cancer

• After diluting in 0.9% NaCl, $D_5$, $D_5W$ and 0.9% NaCl, $D_5LR$ (0.3-1.2 mg/ml) chemo dispensing pin or similar devices with spikes should not be used in vials of Taxol, use in-line filter ≤0.22 micron, give as 3 hr or 24 hr inf

• Use only glass bottles, polypropylene, polyolefin bags and administration sets; do not use PVC inf bags or sets

**Y-site compatibilities:** Acyclovir, amikacin, aminophylline, ampicillin/sulbactam, bleomycin, butorphanol, calcium chloride, CARBOplatin, cefepime, cefoTEtan, cefTAZidime, cefTRIAXone, cimetidine, CISplatin, cladribine, cyclophosphamide, cytarabine, dacarbazine, dexamethasone, diphenhydrAMINE, DOXOrubicin, droperidol, etoposide, famotidine, floxuridine, fluconazole, fluorouracil, furosemide, ganciclovir, gentamicin, granisetron, haloperidol, heparin, hydrocortisone, HYDROmorphone, ifosfamide, LORazepam, magnesium sulfate, mannitol, meperidine, mesna, methotrexate, metoclopramide, morphine, nalbuphine, ondansetron, pentostatin, potassium chloride, prochlorperazine, propofol, ranitidine, sodium bicarbonate, thiotepa, vancomycin, vinBLAStine, vinCRIStine, zidovudine

## >> Abraxane

**Intermittent IV INF route**

• Reconstitute vial by injecting 20 ml of 0.9% NaCl; slowly inject the 20 ml of 0.9% NaCl over at least 1 min to direct the sol flow on wall of vial; do not inject 0.9% NaCl directly onto lyophilized cake (foaming will occur); allow vial to sit for at least 5 min to ensure proper wetting of lyophilized cake; gently swirl or invert vial slowly for at least 2 min until completely dissolved

• Calculate dosing by dosing vol/ml = total dose (mg) ÷ 5 (mg/ml)

# ADVERSE EFFECTS

**CNS:** Peripheral neuropathy
**CV:** *Bradycardia, hypotension, abnormal ECG,* supraventricular tachycardia (SVT)
**GI:** *Nausea, vomiting, diarrhea, mucositis; increased bilirubin, alkaline phosphatase, AST*
**HEMA:** Neutropenia, leukopenia, thrombocytopenia, anemia, bleeding, infections
**INTEG:** Alopecia, tissue necrosis, generalized urticaria, flushing
**MS:** *Arthralgia, myalgia*
**RESP:** Pulmonary embolism, dyspnea
**SYST:** *Hypersensitivity reactions,* anaphylaxis, Stevens-Johnson syndrome, toxic epidermal necrolysis, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Completely absorbed |
| **Distribution** | 89%-98% protein binding |
| **Metabolism** | Liver, extensively |
| **Excretion** | Unknown |
| **Half-life** | 5-17 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-2 wk |
| **Duration** | 3 wk |

# INTERACTIONS

### Individual drugs

CycloSPORINE, dexamethasone, diazepam, etoposide, quiNIDine, teniposide, testosterone, verapamil, vinCRIStine: decreased metabolism of PACLitaxel
DOXOrubicin: increased levels of DOXOrubicin
Ketoconazole: increased toxicity, decreased metabolism; avoid concurrent use
Radiation: increased myelosuppression

### Drug classifications

Anticoagulants, NSAIDs: increased bleeding risk
Antineoplastics: increased myelosuppression
CYP2C8, CYP2C9 inducers: decreased PACLitaxel level
Vaccines (live virus): decreased immune response

### Drug/lab test

Increased: AST/ALT, alk phos, triglycerides
Decreased: neutrophils, platelets, WBCs, Hgb

# NURSING CONSIDERATIONS

### Assessment

• Assess CNS changes: confusion, paresthesias, psychosis, tremors, seizures, neuropathies; product should be discontinued
• Check buccal cavity q8hr for dryness, sores or ulceration, white patches, oral pain, bleeding, dysphagia; obtain prescription for viscous lidocaine (Xylocaine) to use in mouth

**BLACK BOX WARNING:** Requires a specialized care setting such as a hospital or facility capable of managing complications; should be used by a clinician experienced in cytotoxic agents

• **Cardiovascular status:** monitor ECG continuously in CV conditions; monitor for hypotension, sinus bradycardia/tachycardia
• **Peripheral neuropathy:** assess for paresthesias, numbness; during inf use ice packs on extremities to lessen continued neuropathy; use ice on extremities when infusing

• **Arthralgia, myalgia:** may begin 2-3 days after infusion and continue for 4-5 days, may use analgesics
• **Nausea, vomiting:** premedicate with antiemetics, nausea and vomiting occur often
• Monitor renal function tests: BUN, creatinine, serum uric acid, urine CCr before, during therapy; check I&O ratio; report fall in urine output to <30 ml/hr
• Monitor temp q4hr (may indicate beginning of infection)
• Monitor liver function tests before, during therapy (bilirubin, AST, ALT, LDH) as needed or monthly; check for jaundice of skin and sclera, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea
• Assess for bleeding: hematuria, stool guaiac, bruising or petechiae, mucosa or orifices q8hr; check for inflammation of mucosa, breaks in skin
• Assess effects of alopecia on body image; discuss feelings about body changes
• VS during 1st hr of inf, check IV site for signs of infiltration

**BLACK BOX WARNING:** Hypersensitive reactions, anaphylaxis, hypotension, dyspnea, angioedema, generalized urticaria; discontinue inf immediately; keep emergency equipment available, monitor continuously during first 30-60 min, then periodically

• **Flush:** for mild to moderate flush, may continue diphenhydrAMINE for up to 48 hr
• Effects of alopecia on body image; discuss feelings about body changes
• **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

• Teach patient to notify prescriber if pregnancy is planned or suspected (D), do not breastfeed
• Teach patient to avoid use of products containing aspirin or ibuprofen, razors, commercial mouthwash, since bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools)
• Instruct patient to report signs of anemia (fatigue, headache, irritability, faintness, shortness of breath) and CNS reactions (confusion, psychosis, nightmares, seizures, severe headaches)
• Teach patient to rinse mouth tid-qid with water, club soda; brush teeth bid-qid with soft brush or cotton-tipped applicators for stomatitis; use unwaxed dental floss
• Inform patient that hair may be lost during treatment; a wig or hairpiece may make patient feel better; new hair may be different in color, texture
• Inform patient that receiving vaccinations during therapy may cause serious reactions

### Evaluation

**Positive therapeutic outcome**
• Prevention of rapid division of malignant cells

**⚠ HIGH ALERT**

## palbociclib

(pal-boe-sye'klib)
**Ibrance**
*Func. class.:* Antineoplastic
*Chem. class.:* Signal transduction inhibitor

**ACTION:** Inhibits progression of the cell cycle from $G_1$ into S phase, decreased proliferation of ER-positive breast cancer cell lines. When combined with antiestrogen therapy (letrozole), decreases retinoblastoma protein (Rb) phosphorylation, reducing E2F expression and signaling, and increasing growth arrest

**Therapeutic outcome:** Decreased progression of disease

**USES:** Treatment of estrogen receptor (ER)–positive, HER2-negative advanced breast cancer in postmenopausal women, in combination with letrozole as initial endocrine-based therapy

**CONTRAINDICATIONS:** Hypersensitivity

**Precautions:** Breastfeeding, children, fungal/viral infection, infants, infertility, neutropenia, pregnancy, testicular failure, thromboembolic disease

## DOSAGE AND ROUTES

**For the treatment of hormone receptor (HR)-positive, HER2-negative advanced or metastatic breast cancer, with fulvestrant after disease progression following endocrine-based therapy**
**Adult:** females PO 125 mg qday with food for 21 days repeat q28 days with fulvestrant (500 mg IM as two 5 mL injections, one in each buttock, over 1 to 2 min on days 1, 15, 29, and q monthly thereafter)

**Available forms:** Caps 75, 100, 125 mg

### Implementation

**Treatment-related hepatotoxicity:**
• **Grade 1 or 2 hepatotoxicity:** No dosage change
• **Grade ≥3 hepatotoxicity (AST or ALT >5 × ULN or total bilirubin >3 × ULN) that persists despite medical treatment:** Hold until toxicity resolves to grade ≤2 (AST or ALT ≤5 × ULN or total bilirubin ≤3 × ULN), resume treatment at the next lower dose level if not considered a safety risk for the

patient; discontinue if grade ≥3 toxicity occurs at a dose of 75 mg/day

**Treatment-related nephrotoxicity:**

- **Grade 1 or 2 nephrotoxicity:** No change
- **Grade ≥3 nephrotoxicity (CCr >3 × baseline or >4 mg/dl, or requiring hospitalization or dialysis) that persists despite medical treatment:** Hold therapy. When toxicity resolves to grade ≤2 (CCr <3 × baseline or <4 mg/dl), resume at the next lower dose level if not considered a safety risk for the patient, discontinue if grade ≥3 toxicity occurs at a dose of 75 mg/day.

**Other dosage adjustments**

- **Strong CYP3A4 inhibitors:** Avoid concomitant use. If a strong CYP3A4 inhibitor is needed, consider reducing the dose to 75 mg daily; if the strong CYP3A4 inhibitor is discontinued, increase the dose upward to the previously tolerated/recommended dose after a washout period of 3-5 half-lives of the inhibitor.
- **Strong CYP3A4 inducers:** Avoid use

## ADVERSE EFFECTS

**CNS:** Weakness, fever, fatigue
**EENT:** Stomatitis, oral ulceration, glossitis, pharyngitis, sinusitis, epistaxis
**GI:** Vomiting, nausea, anorexia, diarrhea,
**HEMA:** Thrombocytopenia, neutropenia, leukopenia, lymphopenia, anemia
**MISC:** Peripheral neuropathy, alopecia, infection, pulmonary embolism, thromboembolism

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 85% protein bound |
| **Metabolism** | Metabolized by CYP3A |
| **Excretion** | Unknown |
| **Half-life** | Elimination half-life was 24-34 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Peak 6-12 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

CYP3A inhibitors and inducers: avoid concurrent use

### Drug/herb

St. John's wort: Avoid concurrent use

### Drug/food

Avoid use with grapefruit juice

## NURSING CONSIDERATIONS

### Assessment

- **Pregnancy:** Product can cause fetal harm; identify if the patient is pregnant or if pregnancy is planned
- **Pulmonary embolism/thromboembolic events:** Assess for dyspnea/shortness of breath, chest pain, arm or leg swelling, sudden numbness or weakness, severe headache or confusion, or problems with vision, speech, or balance
- **Bone marrow suppression:** Monitor CBC/differential

### Patient/family education

- Identify if pregnancy is planned or suspected. Discuss the need for contraception due to possible fetal harm; avoid breastfeeding
- Advise patient laboratory testing will be needed during treatment
- **Pulmonary/thromboembolic events:** Instruct patient to seek medical attention if dyspnea/shortness of breath, chest pain, arm or leg swelling, sudden numbness or weakness, severe headache or confusion, or problems with vision, speech, or balance develop
- Teach patient to not take with grapefruit juice

### Evaluation

**Positive therapeutic outcome**

- Decreased progression of disease

## paliperidone (Rx)

(pal-ee-per'i-done)
**Invega, Invega Sustenna, Invega Tranza**
*Func. class.:* Antipsychotic (2nd generation)
*Chem. class.:* Benzisoxazole derivative

**Do not confuse:** Invega/Iveegam, paliperidone/risperidone

**ACTION:** Mediated through both dopamine type 2 ($D_2$) and serotonin type 2 ($5\text{-}HT_2$) antagonism

**Therapeutic outcome:** Decrease in emotional excitement, hallucinations, delusions, paranoia; reorganization of patterns of thought, speech

**USES:** Schizophrenia, schizoaffective disorder

**Unlabeled uses:** Agitation

## CONTRAINDICATIONS

Breastfeeding, seizure disorders, AV block, geriatric, QT prolongation, torsades de pointes, hypersensitivity to this product or risperidone

**Precautions:** Pregnancy, children, renal/hepatic disease, obesity, Parkinson's disease, suicidal ideation, diabetes mellitus, hematologic disease

**BLACK BOX WARNING:** Mortality-related psychosis in dementia

## DOSAGE AND ROUTES

**Adult:** PO 6 mg/day; max 12 mg/day; IM 234 mg on day 1, then 156 mg 1 wk later; after 2nd dose, give 117 mg qmo, range 39-234 mg
**Child/adolescent ≥12 yr and ≥51 kg:** PO 3 mg/day, may increase if needed by 3 mg/day in intervals >5 days up to max 12 mg/day; <51 kg max 6 mg/day

### Renal dose

**Adult:** PO CCr 50-79 ml/min, 3 mg/day, max 6 mg/day; ext rel/IM 156 mg on day 1, 117 mg 1 wk later, then 78 mg each mo CCr 10-49 ml/min, 1.5 mg/day, max 3 mg/day; IM not recommended

**Available forms:** Ext rel tabs 1.5, 3, 6, 9 mg; ext rel susp for inj 39 mg/0.25 ml, 78 mg/0.5 ml, 117 mg/0.75 ml, 156 mg/1 ml, 234 mg/1.5 ml; Invega Trinza extended-release suspension 273, 410, 546, 819 mg

### Implementation

**PO route**

- Do not break, crush, or chew ext rel tabs, use plenty of water
- Give without regard for food
- Give a reduced dose to the geriatric patient
- Give antiparkinsonian agent on order from prescriber; to be used for EPS
- Avoid use with CNS depressants
- Supervise ambulation until patient is stabilized on medication; do not involve in strenuous exercise program, because fainting is possible; patient should not stand still for a long time
- Increase fluids to prevent constipation
- Decrease stimulus by dimming lights, avoiding loud noise
- Provide sips of water, candy, gum for dry mouth
- Store in airtight, light-resistant container

**IM route**

- Use for IM only, do not use IV or SUBCUT, injection kits contain a prefilled syringe and 2 safety needles, for single use only, shake for 10 secs
- **Deltoid injection:** ≥ 90 kg use 1.5 inch, 22 G needle; < 90 kg use 1 inch, 23 G needle, alternate injections between deltoid muscles
- **Gluteal injection:** use 1.5 inch, 22 G needle; attach needle to luer connection in clockwise motion, pull needle sheath away using straight pull, bring syringe with attached needle upright to de-aerate, de-aerate, inject; after injection, use finger, thumb or flat surface to activate needle protection system, until click heard, use deltoid × 2 dosages

## ADVERSE EFFECTS

**CNS:** *EPS, pseudoparkinsonism, akathisia, dystonia, tardive dyskinesia; drowsiness, insomnia, agitation, anxiety, headache,* seizures, neuroleptic malignant syndrome, dizziness
**CV:** Orthostatic hypotension, tachycardia, heart failure, QT prolongation, heart block, dysrhythmias
**EENT:** Blurred vision, cough
**ENDO:** Insulin increase, hyperinsulinemia, diabetes mellitus, weight gain, hyperglycemia, dyslipidemia
**GI:** *Nausea,* vomiting, *anorexia, constipation,* weight gain in adolescents, xerostomia
**GU:** Menstrual irregularities
**HEMA:** Agranulocytosis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown, protein binding >74% |
| **Metabolism** | Unknown |
| **Excretion** | 80% urine, 11% feces |
| **Half-life** | Elimination 23 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 24 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Abarelix, alfuzosin, amoxapine, apomorphine, chloroquine, dasatinib, dolasetron, droperidol, flecainide, pimozide: increased QT prolongation
Alcohol: increased sedation
Levodopa: decreased levodopa effect
Lithium: increased neurotoxicity
Paliperidone: decreased effect

### Drug classifications

Azole antifungals; β-blockers; class IA, III antidysrhythmics; halogenated anesthetics; some antipsychotics; some phenothiazines; tricyclics (high doses): increased QT prolongation
SSRIs, SNRIs: increased serotonin syndrome, increased neuroleptic malignant syndrome
Other antipsychotics: increased EPS

Other CNS depressants, sedatives/hypnotics, opiates: increased sedation

### Drug/herb

Betel palm, kava: increased EPS
Cola tree, hops, nettle, nutmeg: increased action
Kava: increased CNS depression

### Drug/lab test

Increased: prolactin levels

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Assess mental status; mood, behavior, confusion, orientation, suicidal thoughts/behaviors; dementia especially in geriatric patients before initial administration and periodically

- **QT prolongation:** monitor ECG for QT prolongation, ejection fraction; assess for chest pain, palpitations, dyspnea
- Assess AIMS assessment, blood glucose, CBC, glycosylated hemoglobulin A1C (HbA1C), LFTs, neurologic function, pregnancy testing, serum creatinine/electrolytes/lipid profile/prolactin, thyroid function tests, weight
- Monitor for swallowing of PO medication; check for hoarding or giving of medication to other patients
- Monitor I&O ratio; palpate bladder if urinary output is low
- Assess affect, orientation, LOC, reflexes, gait, coordination, sleep pattern disturbances
- Monitor B/P standing and lying; also pulse, respirations; take these q4hr during initial treatment; establish baseline before starting treatment; report drops of 30 mm Hg; watch for ECG changes
- Assess for dizziness, faintness, palpitations, tachycardia on rising
- **Hyperprolactinemia:** assess for sexual dysfunction, decreased menstruation, breast pain
- **Assess for EPS,** including akathisia, tardive dyskinesia (bizarre movements of the jaw, mouth, tongue, extremities), pseudoparkinsonism (rigidity, tremors, pill rolling, shuffling gait)
- Assess for serious reactions in the geriatric patient
- **Serotonin syndrome, neuroleptic malignant syndrome:** assess for increased heart rate, shivering, sweating, dilated pupils, tremors, high B/P, monitor for hyperthermia, headache, confusion; if these occur, stop product, administer a serotonin antagonist if needed
- Assess skin turgor daily
- Assess for constipation, urinary retention daily; if these occur, increase bulk and water in diet; monitor for weight gain in adolescents
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, EPS may result in neonate EPS, pregnant patients should enroll in the National Registry for Atypical Antipsychotics 866-961-2388, do not breastfeed
- **Beers:** Avoid in older adults except for schizophrenia, bipolar disorder, or short-term use as an antiemetic in chemotherapy, increases stroke risk

### Patient/family education

- Advise patient that orthostatic hypotension may occur and to rise from sitting or lying position gradually
- Advise patient to avoid hot tubs, hot showers, tub baths; hypotension may occur
- Caution patient to avoid abrupt withdrawal of this product; EPS may result; product should be withdrawn slowly
- Teach patient to avoid OTC preparations (cough, hay fever, cold) unless approved by prescriber; serious product interactions may occur; avoid use of alcohol; increased drowsiness may occur
- Advise patient to avoid hazardous activities if drowsy or dizzy
- Teach patient compliance with product regimen; non-absorbable tab shell is expelled in stool
- Teach patient to avoid abrupt withdrawal of this product, EPS may result; that product should be withdrawn slowly
- Teach patient to report impaired vision, tremors, muscle twitching
- Caution patient that heat stroke may occur in hot weather; take extra precautions to stay cool
- Teach patient to use contraception, inform prescriber if pregnancy is planned or suspected

**BLACK BOX WARNING:** Teach patient to notify prescriber of suicidal thoughts, behaviors, or other changes in behavior; identify dementia in the elderly

### Evaluation

**Positive therapeutic outcome**

- Decrease in emotional excitement, hallucinations, delusions, paranoia; reorganization of patterns of thought, speech

## TREATMENT OF OVERDOSE:

Lavage if orally ingested; provide airway; *do not induce vomiting*

## palonosetron (Rx)

(pa-lone-o'se-tron)
**Aloxi**
*Func. class.:* Antiemetic
*Chem. class.:* 5-$HT_3$ receptor antagonist

**ACTION:** Prevents nausea, vomiting by blocking serotonin peripherally, centrally, and in the small intestine at the 5-$HT_3$ receptor

**Therapeutic outcome:** Decreased nausea, vomiting during chemotherapy

**USES:** Prevention of nausea, vomiting associated with cancer chemotherapy; postoperative nausea/vomiting

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, geriatric, with hypokalemia, hypomagnesemia, patients taking diuretics

## DOSAGE AND ROUTES

**Adult:** **IV** 0.25 mg as a single dose over 30 sec, 30 min prior to chemotherapy, max 0.25 mg **IV**

### Postoperative nausea/vomiting prophylaxis for up to 24 hr after surgery

**Adult:** **IV** 0.075 mg given over 10 sec immediately before induction

**Available forms:** Inj 0.25 mg/5 ml

### Implementation

**Direct IV route**
- Do not mix with other products; flush **IV** line before, after administration
- Store at room temperature
- **Chemotherapy nausea/vomiting:** give as a single dose over 30 seconds
- **Postoperative nausea/vomiting:** give over 10 seconds immediately prior to anesthesia induction

**Y-site compatibilities:** Alemtuzumab, alfentanil, amikacin, aminocaproic acid, aminophylline, amiodarone, amphotericin B liposome, ampicillin, ampicillin/sulbactam, atracurium, atropine, azithromycin, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, busulfan, butorphanol, calcium acetate/chloride/gluconate, CARBOplatin, carmustine, caspofungin, ceFAZolin, cefepime, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, cyclophosphamide, cycloSPORINE, cytarabine, dacarbazine, DACTINomycin, dantrolene, DAPTOmycin, DAUNOrubicin, dexamethasone, dexmedetomidine, dexrazoxane, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doxacurium, DOXOrubicin hydrochloride, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, eptifibatide, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, foscarnet, fosphenytoin, furosemide, gemcitabine, gentamicin, glycopyrrolate, haloperidol, heparin, hydrALAZINE, hydrocortisone, HYDROmorphone, IDArubicin, ifosfamide, inamrinone, insulin, irinotecan, isoproterenol, ketorolac, labetalol, leucovorin, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, meropenem, mesna, metaraminol, methotrexate, methyldopate, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, mitoMYcin, mitoXANtrone, mivacurium, morphine, nalbuphine, naloxone, neostigmine, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, oxaliplatin, oxytocin, PACLitaxel, pamidronate, pancuronium, pentazocine, PHENobarbital, phentolamine, phenylephrine, piperacillin/tazobactam, potassium acetate/chloride/phosphates, procainamide, prochlorperazine, promethazine, propranolol, quinupristin/dalfopristin, ranitidine, remifentanil, rocuronium, sodium acetate/bicarbonate/phosphates, streptozocin, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiotepa, ticarcillin/clavulanate, tigecycline, tirofiban, tobramycin, topotecan, trimethobenzamide, trimethoprim/sulfamethoxazole, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, zidovudine

**Y-site incompatibilities:** Acyclovir, allopurinol, amphotericin B colloidal, diazepam, doxycycline, ganciclovir, imipenem/cilastatin, methylPREDNISolone, minocycline, nafcillin, pantoprazole, pentamidine, PENTobarbital, phenytoin, thiopental

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness, drowsiness, fatigue, insomnia*
**GI:** *Diarrhea, constipation,* abdominal pain
**MISC:** Weakness, hyperkalemia, anxiety, rash, bronchospasm (rare), arthralgia, *fever, urinary retention*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 62% protein bound |
| **Metabolism** | Liver |
| **Excretion** | Unchanged product and metabolites excreted by kidney |
| **Half-life** | 40 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Chloroquine, clarithromycin, droperidol, erythromycin, grepafloxacin, halofantrine, haloperidol, levomethadyl, methadone, pentamidine: possible QT prolongation

Apomorphine: increased: hypotension, severe

### Drug classifications

Class 1A antidysrhythmics (disopyramide, procainamide, quiNIDine), class III antidysrhythmics (amiodarone, dofetilide, ibutilide), diuretics (except potassium sparing), some phenothiazines: possible QT prolongation

### Drug/lab test

Increase: potassium

## NURSING CONSIDERATIONS

### Assessment

- Monitor for absence of nausea, vomiting during chemotherapy
- **Assess hypersensitivity reaction:** rash, bronchospasm
- Assess for agents that cause QT prolongation, avoid using those products
- Cardiac disease: check ECG, PR, QT interval, QRS duration before use
- Hyperkalemia: monitor potassium baseline and periodically
- **Pregnancy/breastfeeding:** Use only if clearly needed, do not breastfeed

### Patient/family education

- Teach to report diarrhea, constipation, rash, or changes in respirations or discomfort at insertion site
- Advise patient to avoid alcohol, barbiturates
- Teach patient to use other antiemetics if nausea occurs

### Evaluation

**Positive therapeutic outcome**

- Absence of nausea, vomiting during cancer chemotherapy

## pamidronate (Rx)

(pam-i-drone'ate)

**Aredia**

*Func. class.:* Bone resorption inhibitor, electrolyte modifier

*Chem. class.:* Bisphosphonate

**Do not confuse:** Aredia/Adriamycin

**ACTION:** Inhibits bone resorption, apparently without inhibiting bone formation and mineralization; absorbs calcium phosphate crystals in bone and may directly block dissolution of hydroxyapatite crystals of bone

**Therapeutic outcome:** Serum calcium at normal level

**USES:** Moderate to severe Paget's disease, hypercalcemia, osteolytic bone metastases in breast cancer patients, multiple myeloma

**Unlabeled uses:** Postmenopausal osteoporosis, hyperparathyroidism

## CONTRAINDICATIONS

Pregnancy, hypersensitivity to bisphosphonates

**Precautions:** Children, nursing mothers, renal dysfunction, poor dentition

## DOSAGE AND ROUTES

### Hypercalcemia of malignancy

**Adult: IV** INF 60-90 mg as a single dose in moderate hypercalcemia, 90 mg in severe hypercalcemia given over 2-24 hr; dose should be diluted in 1000 ml 0.45% NaCl, 0.9% NaCl, or $D_5W$; wait 7 days before 2nd course

### Osteolytic lesions

**Adult: IV** 90 mg/500 ml of $D_5W$, 0.45% NaCl, or 0.9% NaCl given over 4 hr on a monthly basis (multiple myeloma) or over 2 hr q3-4wk (breast carcinoma)

### Paget's disease

**Adult: IV** INF 30 mg/day given over 4 hr × 3 days

**Available forms:** Powder for inj 30, 90 mg/vial; inj 3, 6, 9 mg/ml

### Implementation

**IV route**

- After reconstituting by adding 10 ml of sterile water for inj to each vial (30 mg/10 ml or 90 mg/10 ml depending on vial used); add to 1000 ml of sterile 0.45%, 0.9% NaCl, $D_5W$, run over 2-24 hr **(hypercalcemia);** dilute reconstituted sol in 500 ml of 0.9% NaCl, 0.45% NaCl, or $D_5W$, give over 4 hr **(multiple myeloma, Paget's disease);** dilute reconstituted sol in 250 ml

of 0.9% NaCl, 0.45% NaCl or $D_5W$, give over 2 hr **(osteolytic bone metastases of breast cancer)**
- Store inf sol for up to 24 hr at room temperature
- Monitor IV site for pain, redness
- Reconstituted sol with sterile water may be stored under refrigeration for up to 24 hr
- Do not mix with calcium-containing inf sol such as Ringer's sol

**Y-site compatibilities:** Acyclovir, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amphotericin B lipid complex, amphotericin B liposome, ampicillin, anidulafungin, atenolol, atracurium, azithromycin, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, CARBOplatin, carmustine, ceFAZolin, cefepime, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, cyclophosphamide, cycloSPORINE, cytarabine, dacarbazine, DAPTOmycin, dexamethasone, dexmedetomidine, dexrazoxane, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doxacurium, DOXOrubicin, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, ertapenem, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, foscarnet, fosphenytoin, furosemide, gallium, ganciclovir, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, haloperidol, heparin, hetastarch 6%, hydrALAZINE, hydrocortisone, HYDROmorphone, hydrOXYzine, ifosfamide, imipenem-cilastatin, inamrinone, insulin (regular), isoproterenol, ketorolac, labetalol, levofloxacin, levorphanol, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, meropenem, mesna, metaraminol, methotrexate, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, minocycline, mitoXANtrone, mivacurium, morphine, mycophenolate, nafcillin, nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxytocin, PACLitaxel, palonosetron, pancuronium, PEMEtrexed, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phenylephrine, piperacillin, polymyxin B, potassium chloride/phosphates, procainamide, prochlorperazine, promethazine, propranolol, quiNIDine, quinupristin-dalfopristin, ranitidine, remifentanil, rocuronium, sodium acetate/bicarbonate/phosphates, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, teniposide, theophylline, thiopental, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, topotecan, trimethobenzamide, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRISTine, vinorelbine, voriconazole, zidovudine

## ADVERSE EFFECTS

**CNS:** Fatigue, *fever*
**CV:** *Hypertension,* atrial fibrillation
**EENT:** Ocular pain, inflammation, vision impairment
**GI:** *Abdominal pain, anorexia, constipation, nausea, vomiting,* dyspepsia
**GU:** Renal failure
**HEMA:** Thrombocytopenia, anemia, leukopenia
**INTEG:** Redness, swelling, induration, pain on palpation at site of catheter insertion
**META:** Hypokalemia, hypomagnesemia, hypophosphatemia, hypocalcemia, hypothyroidism
**MS:** *Severe bone pain,* myalgia, osteonecrosis of the jaw
**RESP:** Coughing, dyspnea, URI
**SYST:** Angioedema, anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly cleared from circulation |
| **Distribution** | Mainly to bones, primarily in areas of high bone turnover |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys, unchanged (50%) |
| **Half-life** | Biphasic 27 hr; from bone to 300 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 1 day |
| **Peak** | 1 wk |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Calcium, vitamin D: decreased pamidronate effect
CycloSPORINE, tacrolimus, vancomycin: increased nephrotoxicity
Entecavir: increased effect of entecavir

### Drug classifications

Aminoglycosides, NSAIDs, radiopaque contrast agents: increased nephrotoxicity
Loop diuretics: increased hypokalemia

### Drug/lab test

Increased: creatinine
Decreased: potassium, magnesium, phosphate, calcium, WBC, platelets

## NURSING CONSIDERATIONS

### Assessment

- **Dental health:** Optimal dental health should be obtained before treatment with this product; give antiinfectives for dental extractions
- Monitor WBCs, platelets, electrolytes, creatinine, BUN, Hgb/Hct prior to beginning treatment
- Temperature may be elevated during the first 3 days after a dose; risk of fever increases as dose increases
- **Renal disease:** max 90 mg single dose, longer infusions >2 hr may increase risk for renal toxicity
- **Hypocalcemia:** assess for nausea, vomiting, constipation, thirst, dysrhythmias, hypocalcemia, paresthesia, twitching, laryngospasm, Chvostek's, Trousseau's signs; **hypercalcemia:** thirst, nausea, vomiting, dysrhythmias
- **Dehydration/hypovolemia:** should be corrected during treatment of hypercalcemia, prior to therapy; maintain adequate urine output
- **Pregnancy/breastfeeding:** Do not use in pregnancy/breastfeeding, use contraception
- Assess for atrial fibrillation
- Assess fluid volume status: check I&O ratio and record, assess for distended red veins, crackles in lung, color, quality, and specific gravity of urine, skin turgor, adequacy of pulses, moist mucous membranes, bilateral lung sounds, peripheral pitting edema
- Monitor electrolytes: phosphorus, potassium, sodium, calcium, magnesium; also include BUN, creatinine, CBC, platelets, hemoglobin, electrolytes (calcium, potassium, magnesium)
- Assess B/P before, during therapy
- Assess for pain: in joints or on exertion, duration and characteristics; analgesics may be ordered
- Assess for phlebitis at **IV** site: swelling, redness, pain, warmth

### Patient/family education

- Advise patient to report hypercalcemic relapse: nausea, vomiting, bone pain, thirst; unusual muscle twitching, muscle spasms, severe diarrhea, constipation, ocular symptoms
- Advise patient to continue with dietary recommendations, including calcium and vit D
- To obtain an analgesic from provider for bone pain
- Advise patient that small, frequent meals may help nausea/vomiting
- Teach patient to notify prescriber if is planned or suspected, to use contraception
- Advise patient to maintain good oral hygiene, have regular dental check-ups
- Teach patient to report dental or jaw pain to prescriber immediately

### Evaluation

**Positive therapeutic outcome**

- Decreased calcium levels to normal

## pancrelipase (Rx)

(pan-kre-li'pase)

**Creon, Cotazym, Pancrease, Pancreaze, Pancrease-V, Pancrecarb MS, Pertyze, Ultrase, Ultrase MT, VioKase, Zenpep**

*Func. class.:* Digestant

*Chem. class.:* Pancreatic enzyme (bovine/porcine)

**ACTION:** Pancreatic enzyme needed for breakdown of substances released from the pancreas

**Therapeutic outcome:** Increases protein, fat, carbohydrate digestion

**USES:** Exocrine pancreatic secretion insufficiency, cystic fibrosis (digestive aid), steatorrhea, pancreatic enzyme deficiency

## CONTRAINDICATIONS

Allergy to pork

**Precautions:** Pregnancy, ileus, pancreatitis, Crohn's disease, diabetes mellitus

## DOSAGE AND ROUTES

Many products listed above are not interchangeable

### Del rel caps—Creon caps, Zenpep caps, Pancreaze caps

**Adult/adolescent/child ≥4 yr:** PO 500 lipase units/kg/meal, titrate based on response, max 2500 lipase units/kg/meal

**Child 1<4 yr:** PO 1000 lipase units/kg/meal, titrate based on response, max 2500 lipase units/kg/meal

**Available forms:** Tabs (VioKase) 10, 20 units; cap, del rel 4, 8, 16 units (Pancrecarb MS), 12, 18, 20 units (Ultrase MT), Ultrase: cap 3000, 4200, 5000, 6000, 8000, 10,500, 12,000, 15,000, 16,000, 16,800, 24,000, 25,000 units

### Implementation

- Give after antacid or cimetidine; decreased pH inactivates product
- Administer low-fat diet to decrease GI symptoms
- Provide adequate hydration
- Store in airtight container at room temperature
- Do not crush, chew del rel products, caps

## ADVERSE EFFECTS

**ENDO:** Hyperglycemia, hypoglycemia
**GI:** Anorexia, nausea, vomiting, diarrhea, cramping, bloating
**GU:** Hyperuricuria, hyperuricemia

### Pharmacokinetics

Unknown

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Acarbose, miglitol: decreased effects of each specific drug
Cimetidine, iron (oral): decreased absorption of pancrelipase

### Drug classifications

Antacids: decreased absorption of pancrelipase

## NURSING CONSIDERATIONS

### Assessment

- Monitor I&O ratio; watch for increasing urinary output
- Monitor fecal fat, nitrogen, pro-time during treatment
- Monitor for polyuria, polydipsia, polyphagia (may indicate diabetes mellitus); monitor glucose level more frequently
- Assess for allergy to pork; patient may also be sensitive to this product
- Assess for appropriate weight, height, development; there may be a developmental lag
- Check stools for steatorrhea, which signifies undigested fat content
- **Pregnancy/breastfeeding:** Use only if clearly needed, can be used in breastfeeding

### Patient/family education

- Teach patient to always take with food, not to crush, chew del rel product, caps
- Instruct patient to store at room temperature, away from moisture
- Teach patient to take tab with 8 oz or more water, not to let tab sit in mouth; have patient take tab sitting up only
- Advise patient to notify prescriber of allergic reactions, abdominal pain, cramping, or hematuria

### Evaluation

**Positive therapeutic outcome**

- Absence of steatorrhea
- Improved digestion of carbohydrates, proteins, fat

**⚠ HIGH ALERT**

## pancuronium (Rx)

(pan-cure-oh'nee-yum)
*Func. class.:* Neuromuscular blocker (nondepolarizing)
*Chem. class.:* Synthetic curariform

**ACTION:** Inhibits transmission of nerve impulses by binding with cholinergic receptor sites, antagonizing action of acetylcholine

**Therapeutic outcome:** Paralysis of all skeletal muscles

**USES:** Facilitation of endotracheal intubation, skeletal muscle relaxation during mechanical ventilation, surgery, or general anesthesia

## CONTRAINDICATIONS

Hypersensitivity to bromide ion

**Precautions:** Pregnancy, breastfeeding, children <2 yr, renal/hepatic/cardiac/neuromuscular disease, electrolyte imbalances, dehydration, previous anaphylactic reactions (other neuromuscular blockers), respiratory insufficiency

**BLACK BOX WARNING:** Requires an experienced clinician

## DOSAGE AND ROUTES

**Adult/child/infant >1 mo: IV** 0.04-0.1 mg/kg initially or 0.05 mg/kg after initial dose of succinylcholine; maintenance 0.01 mg/kg 60-100 min after initial dose, then 0.01 mg/kg q25-60min as needed; in obese patients, use ideal body weight

**Neonate <1 mo: IV** test dose 0.02 mg/kg, then 0.03 mg/kg/dose initially, repeat 2 × as needed at 5-10 min intervals; maintenance 0.03-0.09 mg/kg/dose q30min-4hr as needed

**Available forms:** Inj 1, 2 mg/ml

### Implementation

- Use peripheral nerve stimulator (anesthesiologist) to determine neuromuscular blockade; deep tendon reflexes should be monitored during extended periods

**Direct IV route**

- Give undiluted over 1-2 min (1 mg/ml [10 ml vial], 2 mg/ml [2, 5 ml vial])

**Intermittent IV infusion route**

- Add 100 mg of product to 250 ml $D_5W$, 0.9% NaCl, or LR (0.4 mg/ml)
- Store in light-resistant area
- Give anticholinesterase to reverse neuromuscular blockade

**Y-site compatibilities:** Aminophylline, ceFAZolin, cefuroxime, cimetidine, DOBUTamine, DOPamine, EPINEPHrine, esmolol, fentaNYL, fluconazole, gentamicin, heparin, hydrocortisone, isoproterenol, LORazepam, midazolam, morphine, nitroglycerin, nitroprusside, ranitidine, sulfamethoxazole/trimethoprim, vancomycin

**Y-site incompatibilities:** Diazepam

**Additive compatibilities:** Verapamil

**Additive incompatibilities:** Barbiturates

## ADVERSE EFFECTS

**CV:** Bradycardia, tachycardia, increased, decreased B/P, ventricular extrasystoles, edema, hypotension
**EENT:** Increased secretions
**INTEG:** Rash, flushing, pruritus, urticaria, sweating, salivation
**MS:** Weakness to prolonged skeletal muscle relaxation
**RESP:** Prolonged apnea, bronchospasm, cyanosis, respiratory depression, dyspnea
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete bioavailability |
| **Distribution** | Extracellular space; crosses placenta |
| **Metabolism** | Plasma |
| **Excretion** | Kidneys, unchanged |
| **Half-life** | 2 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 3-5 min, dose dependent |
| **Peak** | 3-5 min |
| **Duration** | 35-40 min |

## INTERACTIONS

### Individual products

Clindamycin, enflurane, isoflurane, lincomycin, lithium, quiNIDine: increased neuromuscular blockade
Theophylline: dysrhythmias

### Drug classifications

Aminoglycosides, anesthetics (local), analgesics (opioid), polymyxin antiinfectives, thiazides: increased neuromuscular blockade

### Drug/lab test

Decreased: cholinesterase

## NURSING CONSIDERATIONS

### Assessment

- Monitor vital signs (B/P, pulse, respirations, airway) until fully recovered; note rate, depth, pattern of respirations, strength of hand grip; patient should be intubated before use
- Monitor for electrolyte imbalances (potassium, magnesium) before product is used; electrolyte imbalances may lead to increased action of this product
- **Monitor for recovery:** decreased paralysis of face, diaphragm, leg, arm, rest of body; residual weakness and respiratory problems may occur during recovery period
- **Assess for hypersensitive reactions, anaphylaxis:** rash, fever, respiratory distress, pruritus; product should be discontinued
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, breast milk excretion unknown

### Patient/family education

- Provide reassurance if communication is difficult during recovery from neuromuscular blockade
- Provide explanation to patients regarding all procedures or treatments; patient will remain conscious if anesthesia is not given also

### Evaluation

**Positive therapeutic outcome**

- Paralysis of jaw, eyelid, head, neck, rest of body as evaluated by peripheral nerve stimulator

## TREATMENT OF OVERDOSE:

Neostigmine, atropine; monitor VS; may require mechanical ventilation

**⚠ HIGH ALERT**

# panitumumab (Rx)

(pan-i-tue′moo-mab)
**Vectibix**
*Func. class.:* Antineoplastic—miscellaneous
*Chem. class.:* Multikinase inhibitor, signal transduction inhibitor

P

## ACTION:

Decreases growth and survival of cancer cells by competitive inhibition of EGF receptor

**Therapeutic outcome:** Decrease in colon carcinoma progression

## USES:

EGFR expressing metastatic colorectal cancer, not beneficial in *KRAS* mutations in codon 12 or 13

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, hepatic disease, acute bronchospasm, diarrhea, hamster protein allergy, hypomagnesemia, hypotension, pulmonary fibrosis, sepsis, *KRAS* mutations, soft-tissue toxicities infusion-related reactions

**BLACK BOX WARNING:** Exfoliative dermatitis

## DOSAGE AND ROUTES

**Adult: IV** INF 6 mg/kg over 60 min q2wk; doses > 1000 mg over 90 min

**Available forms:** Sol for inj 20 mg/ml (100 mg/5 ml, 400 mg/20 ml)

### Implementation

**Intermittent IV infusion route**

- Give in hospital or clinic setting with full resuscitation equipment
- Give only as IV inf using controlled IV inf pump; do not give **IV** push or bolus; use low-protein binding 0.2 or 0.22 micron in-line filter; flush line with 0.9% NaCl before, after administration
- Give over 60 min through a peripheral line or in-dwelling catheter; inf doses of >1000 mg over 90 min
- Dilute in 100 ml of 0.9% NaCl; dilute doses >1000 mg in 150 ml of 0.9% NaCl; mix by inverting; max 10 mg/ml; use within 6 hr if stored at room temperature; can be stored between 2°-8° C for up to 24 hr
- Store unopened vials in refrigerator; do not shake; protect from direct sunlight; do not freeze

**Dosage adjustment for infusion/dermatologic reaction**

- **Grade 1/2:** reduce infusion by 50%; Grade 3/4: terminate, permanently discontinue depending on severity/resistance

## ADVERSE EFFECTS

**CNS:** Fatigue
**CV:** Peripheral edema
**EENT:** Ocular irritation, ocular toxicity
**GI:** *Nausea, diarrhea, vomiting,* anorexia, mouth ulceration, abdominal pain, constipation
**HEMA:** Thrombophlebitis
**INTEG:** *Rash,* pruritus, exfoliative dermatitis, skin fissure, angioedema, severe/fatal infusion reactions
**META:** Hypocalcemia, hypomagnesemia, antibody formation
**RESP:** Bronchospasm, cough, dyspnea, hypoxia, pulmonary fibrosis/embolism, pneumonitis, wheezing, interstitial lung disease

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 38%-49%, high-fat meal decreases absorption |
| **Distribution** | Protein binding 99.5% |
| **Metabolism** | Liver, oxidative metabolism by CYP3A4, glucuronidation by UGT1A9, some Asian patients (15%-20%) are poor metabolizers |
| **Excretion** | Feces 77% |
| **Half-life** | Elimination 7.5 day |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 3 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Antineoplastics, other: do not use with other products

## NURSING CONSIDERATIONS

### Assessment

- **Pulmonary fibrosis:** assess for dyspnea, cough, wheezing, may need to discontinue

**BLACK BOX WARNING: Serious skin disorders:** assess for fever, sore throat, fatigue, then lesions in mouth, lips; withhold product, notify prescriber

- Monitor serum electrolytes periodically (calcium, magnesium)
- Assess for signs of infection: increased temperature
- **Assess for signs of infusion reactions:** bronchospasm, fever, chills, hypotension; may require discontinuation; have emergency equipment available
- **Assess for signs of ocular toxicity:** ocular irritation, hyperemia
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

- **Instruct patient to report adverse reactions immediately:** difficulty breathing, mouth sores, skin rash, ocular toxicity
- Teach patient reason for treatment, expected results, adverse reactions
- Teach males/females to use contraception while taking this product and for 6 mo after treatment; do not breastfeed for at least 2 mo after treatment, enroll in Amgen's Pregnancy Surveillance Program (800-772-6436)
- Advise to use sunscreen while taking, 2 mo after

### Evaluation

**Positive therapeutic outcome**

- Decrease in colon carcinoma progression

## pantoprazole (Rx)

(pan-toe-pray'zole)
**Panto, Pantoloc, Protonix, Protonix IV, Tecta**
*Func. class.:* Proton pump inhibitor
*Chem. class.:* Benzimidazole

**Do not confuse:** Protonix/Lotronex/Protamine

**ACTION:** Suppresses gastric secretion by inhibiting hydrogen/potassium ATPase enzyme system in gastric parietal cell; characterized as gastric acid pump inhibitor, since it blocks final step of acid production

**Therapeutic outcome:** Absence of epigastric fullness, pain, swelling

**USES:** Gastroesophageal reflux disease (GERD), severe erosive esophagitis, maintenance, long-term pathological hypersecretory conditions including Zollinger-Ellison syndrome

## CONTRAINDICATIONS

Hypersensitivity to this product or benzimidazole

**Precautions:** Pregnancy, breastfeeding, children, proton pump hypersensitivity

## DOSAGE AND ROUTES

### GERD

**Adult:** PO 40 mg/day × 8 wk, may repeat course

### Erosive esophagitis

**Adult:** **IV** 40 mg/day × 7-10 days; PO 40 mg/day × 8 wk; may repeat PO course

### Pathologic hypersecretory conditions

**Adult:** PO 40 mg bid; **IV** 80 mg q12hr; max 240 mg/day

**Available forms:** Del rel tabs 20, 40 mg; powder for inj 40 mg/vial; del rel granules for susp 40 mg

### Implementation

- Swallow del rel tabs whole; do not break, crush, or chew
- May take with or without food
- **Suspension:** give in apple juice 30 min before a meal or sprinkled on 1 tbsp of applesauce
- **NG tube:** empty contents of packet of granules into barrel of a 60-ml catheter tip syringe (plunger removed) connected to ≥16F NG tube; add 10 ml apple juice and tap or shake barrel of syringe to empty into the tube; add another 10 ml of apple juice; rinse with additional apple juice until syringe is clear

**IV route**

- **Use of Protonix IV vials with spiked IV system adaptors is not recommended**
- Visually inspect for particulate matter and discoloration prior to use
- Give as an IV infusion over 15 min either through a dedicated line or a Y-site; a 2-min slow injection regimen is also approved; do not give fast IV push
- When using a Y-site, immediately stop use if a precipitation or discoloration occurs

**Reconstitution of vial:**

- Use 40 mg vial/10 ml NS; do not freeze

**2-minute slow intravenous (IV) infusion injection:**

- Dilute one or two 40-mg vials with 10 ml NS per vial to 4 mg/ml, store up to 24 hr at room temperature prior to use; infuse slowly over at least 2 min; do not give with other IV fluids or medications; flush line with $D_5W$, NS, or LR before and after each dose

**15-minute intravenous (IV) infusion:**

- Dilute each 40 mg dose with 10 ml NS; the reconstituted vial should be further admixed with 100 ml (for one vial) or 80 ml (for 2 vials) of $D_5W$, NS, or LR (to 0.4 mg/ml or 0.8 mg/ml, respectively), store up to 6 hr at room temperature prior to further dilution; the admixed solution (0.4 mg/ml or 0.8 mg/ml) may be stored at room temperature and must be used within 24 hr from the time of initial reconstitution; infuse over 15 min at 7 ml/min; do not administer with other IV fluids or medications; flush the IV line with $D_5W$, NS, or LR before and after each dose

## ADVERSE EFFECTS

**CNS:** *Headache,* insomnia, asthenia, fatigue, malaise, insomnia, somnolence
**GI:** *Diarrhea, abdominal pain,* flatulence, pancreatitis, weight changes, pseudomembranous colitis
**INTEG:** *Rash*
**META:** Hyperglycemia, weight gain/loss, hyponatremia, hypomagnesemia, vitamin $B_{12}$ deficiency
**MS:** Rhabdomyolysis, myalgia
**RESP:** Pneumonia
**SYST:** Stevens-Johnson syndrome, toxic epidermal necrolysis, anaphylaxis, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 97% |
| **Metabolism** | Unknown |
| **Excretion** | Urine-metabolites, feces, decreased rate in geriatric patients; Genetic Warning some Asian patients (15%-20%) may be poor metabolizers |
| **Half-life** | 1½ hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2.4 hr |
| **Duration** | >24 hr |

## INTERACTIONS

### Individual drugs

Calcium carbonate, sucralfate, vit $B_{12}$, ketoconazole, itraconazole, atazanavir, ampicillin, iron salts: decreased absorption of these products

Clarithromycin, diazepam, flurazepam, phenytoin, triazolam: increased levels of pantoprazole
Clopidogrel: decreased clopidogrel effect
Warfarin: increased risk of bleeding

### Drug/herb
St. John's wort: decreased effect of pantoprazole

## NURSING CONSIDERATIONS
### Assessment
- **Rhabdomyolysis:** muscle pain, increased CPK, weakness, swelling of affected muscles; if these occur and if confirmed by CPK, product should be discontinued
- Assess GI system: bowel sounds q8hr, abdomen for pain, swelling, anorexia
- Monitor hepatic enzymes: AST, ALT, alkaline phosphatase during treatment
- **Serious skin reactions:** assess for toxic epidermal necrolysis, Stevens-Johnson syndrome, exfoliative dermatitis; fever, sore throat, fatigue, thin ulcers, lesions in the mouth, lips
- **Electrolyte imbalances:** hyponatremia; hypomagnesemia in those using this product (3 mo-1 yr) if hypomagnesemia occurs, use of magnesium supplements may be sufficient; if severe, discontinuation of this product may be required
- **Pregnancy/breastfeeding:** Use only if clearly needed, do not breastfeed
- **Beers:** Avoid in older adults for >8 wk unless for high-risk patients, risk of *Clostridium difficile,* fractures

### Patient/family education
- Advise patient to report severe diarrhea; product may have to be discontinued
- Advise patient with diabetes that hyperglycemia may occur
- Advise patient to avoid hazardous activities; dizziness may occur
- Advise patient to avoid alcohol, salicylates, ibuprofen; may cause GI irritation

### Evaluation
**Positive therapeutic outcome**
- Absence of epigastric pain, swelling, fullness

## PARoxetine (Rx)
(par-ox′e-teen)
**Brisdelle, Paxil, Paxil CR, Pexeva, PMS**
*Func. class.:* Antidepressant, selective serotonin reuptake inhibitor (SSRI)
*Chem. class.:* Phenylpiperidine derivative

**Do not confuse:** PARoxetine/FLUoxetine/PACLitaxel, Piroxicam Paxil/PACLitaxel/Doxil/Plavix/Lexiva

**ACTION:** Inhibits CNS neuron reuptake of serotonin but not of norepinephrine or DOPamine

**Therapeutic outcome:** Relief of depression

**USES:** Major depressive disorder, obsessive-compulsive disorder, panic disorder, generalized anxiety disorder, posttraumatic stress disorder, premenstrual disorders, social anxiety disorder

**Unlabeled uses:** Premature ejaculation

## CONTRAINDICATIONS
Pregnancy, hypersensitivity, MAOI use, alcohol use

**Precautions:** Breastfeeding, geriatric, seizure history, patients with history of mania, renal/hepatic disease

**BLACK BOX WARNING:** Children, suicidal ideation

## DOSAGE AND ROUTES
### Depression
**Adult:** PO 20 mg/day in AM; after 4 wk if no clinical improvement is noted, dosage may be increased by 10 mg/day weekly to desired response; max 50 mg/day; or CONT REL 25 mg/day, may increase by 12.5 mg/day weekly up to 62.5 mg/day
**Geriatric:** PO 10 mg/day, increase by 10 mg to desired dose, max 40 mg/day

### Obsessive-compulsive disorder
**Adult:** PO 40 mg/day in AM; start with 20 mg/day, increase 10 mg/day increments, max 60 mg/day

### Panic disorder
**Adult:** Start with 10 mg/day and increase in 10 mg/day increments to 40 mg/day, max 60 mg/day; or CONT REL 12.5 mg/day max 75 mg/day

### Generalized anxiety disorder
**Adult:** PO 20 mg/day in AM, range 20-50 mg/day

### Posttraumatic stress disorder
**Adult:** PO 20 mg/day, range 20-60 mg/day

### Premenstrual disorders
**Adult:** CONT REL 12.5 mg/day in AM

### Renal dose
**Adult:** PO CCr 30-60 ml/min lower doses may be needed, CCr <30 ml/min 10 mg/day in AM, may increase by 10 mg/day qwk, max 40 mg/day; or CONT REL 12.5 mg/day max 50 mg/day

### Hepatic dose
**Adult:** PO 10 mg/day initially, max 40 mg regular release, CONT REL 12.5 mg/day initially, max 50 mg/day

**Available forms:** Tabs 10, 20, 30, 40 mg; oral susp 10 mg/5 ml; cont rel 12.5, 25, 37.5 mg, cap 7.5 mg

### Implementation

- Give with food or milk for GI symptoms; store at room temperature; do not freeze
- Give crushed if patient is unable to swallow whole, regular release only
- Use gum, hard candy, frequent sips of water for dry mouth
- Avoid use with other CNS depressants
- **Oral susp:** shake, measure with oral syringe or calibrated measuring device
- **Cont rel tab:** do not cut, chew, crush; do not give concurrently with antacids

## ADVERSE EFFECTS

**CNS:** *Headache, nervousness, insomnia, drowsiness, anxiety, tremor, dizziness, fatigue, sedation,* abnormal dreams, agitation, apathy, euphoria, hallucinations, delusions, psychosis, seizures, malignant neuroleptic syndrome–like reactions, restless legs syndrome
**CV:** Vasodilatation, postural hypotension, palpitations, bleeding
**EENT:** Visual changes
**GI:** *Nausea, diarrhea, constipation, dry mouth, anorexia,* dyspepsia, vomiting, taste changes, flatulence, decreased appetite, cramps
**GU:** Dysmenorrhea, decreased libido, urinary frequency, UTI, amenorrhea, cystitis, impotence, decreased sperm quality, decreased fertility, *abnormal ejaculation* (male)
**INTEG:** *Sweating,* rash
**MS:** Pain, arthritis, myalgia, myopathy, myasthenia
**RESP:** Infection, pharyngitis, nasal congestion, sinus headache, sinusitis, cough, dyspnea, yawning
**SYST:** Asthenia, fever, abrupt withdrawal syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed; crosses blood-brain barrier, protein-binding 95% |
| **Metabolism** | Liver, mostly by CYP2D6 enzyme system, 7% may be poor metabolizers |
| **Excretion** | Kidneys, unchanged (2%); breast milk |
| **Half-life** | 21 hr (reg rel); 15-20 hr (cont rel) |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 5.2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Methylphenidate, traMADol: increased serotonin syndrome
Cimetidine: increased PARoxetine levels
Digoxin: decreased effect of digoxin
L-tryptophan: increased agitation
PHENobarbital: decreased PARoxetine levels
Phenytoin: decreased effect of PARoxetine
- **Pimozide:** potentially fatal reactions

Theophylline: increased theophylline levels
- **Thioridazine:** do not use with PARoxetine; hypertensive crisis, seizures, potentially fatal reactions can occur

Warfarin: increased bleeding

### Drug classifications

CYP2D6 inhibitors (aprepitant, delavirdine, imatinib, nefazodone): increased toxicity
Highly protein-bound products: increased side effects
- **MAOIs:** hypertensive crisis, seizures; do not use together; potentially fatal reactions can occur

SSRIs, SNRIs, atypical antipsychotics, serotonin-receptor agonists, tricyclics, amphetamines: increased serotonin syndrome
NSAIDs, thrombolytics, salicylates, platelet inhibitors, anticoagulants: increased bleeding

### Drug/herb

Ephedra: hypertensive crisis
Kava: avoid use
St. John's wort: possible serotonin syndrome, avoid use

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Depression/OCD/anxiety/panic attacks:** assess mental status: mood, sensorium, affect, suicidal tendencies (especially in child/young adult), increase in psychiatric symptoms, increasing obsessive thoughts, compulsive behaviors, restrict amount available

- **Postural hypotension:** monitor B/P (lying/standing), pulse q4hr; if systolic B/P drops 20 mm Hg, hold product, notify prescriber; take vital signs q4hr in patients with CV disease
- **Renal status:** monitor BUN, creatinine, urinary retention

• **Withdrawal symptoms:** assess for headache, nausea, vomiting, muscle pain, weakness; not usual unless product discontinued abruptly, taper over 1-2 wk
• **Serotonin, neuroleptic malignant syndrome:** assess for hallucinations, coma, headache, agitation, shivering/sweating, tachycardia, diarrhea, tremor, hypertension, hyperthermia, rigidity, delirium, coma, myoclonus, agitation, nausea, vomiting
• Monitor blood studies: CBC, leukocytes, differential, cardiac enzymes if patient is receiving long-term therapy
• Monitor hepatic studies: AST, ALT, bilirubin
• Check weight weekly; appetite may increase with product
• Assess ECG for flattening of T-wave, bundle branch block, AV block, dysrhythmias in cardiac patients
• Assess for EPS primarily in geriatric: rigidity, dystonia, akathisia
• Monitor urinary retention, constipation; constipation is more likely to occur in children or geriatric
• Identify alcohol consumption; if alcohol is consumed, hold dose until AM
• **Pregnancy/breastfeeding:** Do not use in pregnancy/breastfeeding

### Patient/family education

• Advise patient that therapeutic effects may take 1-4 wk
• Teach patient to use caution in driving and other activities requiring alertness because of drowsiness, dizziness, blurred vision; to avoid rising quickly from sitting to standing, especially geriatric
• Caution patient to avoid alcohol ingestion, other CNS depressants, and OTC medication unless prescribed
• Caution patient not to discontinue medication quickly after long-term use; may cause nausea, anxiety, headache, malaise; do not double doses if one is missed
• Advise patient to use gum, hard sugarless candy, or frequent sips of water for dry mouth; if dry mouth continues an artificial saliva product may be used

**BLACK BOX WARNING:** Advise patient that depression may worsen, suicidal thoughts/behavior may occur (especially in child/young adult), to notify prescriber immediately

• Advise patient to discuss sexual side effects: impotence, possible male infertility while taking this product

### Evaluation

**Positive therapeutic outcome**
• Decrease in depression
• Absence of suicidal thoughts

## TREATMENT OF OVERDOSE:

Gastric lavage, maintain airway; for seizures give diazepam, symptomatic treatment

**⚠ HIGH ALERT**

## pazopanib

(paz-oh′pa-nib)
**Votrient**
*Func. class.:* Antineoplastic biologic response modifier/multikinase angiogenesis inhibitor
*Chem. class.:* Kinase inhibitor

## ACTION:

Targets vascular endothelial growth factor receptors; a multikinase angiogenesis inhibitor

**Therapeutic outcome:** Decrease in size, spread of tumor

## USES:

Advanced renal cell carcinoma; soft-tissue sarcoma patients who have received prior chemotherapy

## CONTRAINDICATIONS

Pregnancy, hypothyroidism, QT prolongation, MI, wound dehiscence, hypertension

**Precautions:** Breastfeeding, children, cardiac/renal/hepatic/dental disease, GI bleeding

**BLACK BOX WARNING:** Hepatic disease

## DOSAGE AND ROUTES

**Adult: PO** 800 mg/day without food (1 hr before, 2 hr after a meal), may decrease to 400 mg/day if not tolerated (renal cell cancer); or adjust in 200-mg increments based on toxicity (soft-tissue sarcoma)

**Available forms:** Tabs 200 mg

### Implementation

• Give on an empty stomach (1 hr before or 2 hr after a meal); separate doses by 24 hr
• Do not crush tablets, can lead to an increased rate of absorption, which can affect systemic exposure; only intact, whole tablets should be used
• If a dose is missed, it should not be taken if it is ≤12 hr until the next dose
• Store at 77°F (25°C)

## ADVERSE EFFECTS

**CNS:** Intracranial bleeding, headache

**CV:** Heart failure, hypertension, hypertensive crisis, chest pain, MI, QT prolongation, torsades de pointes
**GI:** Nausea, hepatotoxicity, vomiting, dyspepsia, GI hemorrhage, anorexia, abdominal pain, GI perforation, pancreatitis, diarrhea; hepatotoxicity (geriatric)
**HEMA:** Neutropenia, thrombocytopenia, bleeding
**INTEG:** Rash, alopecia
**MISC:** Fatigue, epistaxis, pyrexia, hot sweats, increased weight, flulike symptoms, hypothyroidism, hand–foot syndrome, retinal tear/detachment

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 99% |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 31 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-4 hr |
| **Duration** | 24 hr |

## INTERACTIONS

### Individual drugs

Arsenic trioxide, levomethadyl, haloperidol, chloroquine, droperidol, pentamidine: increased QT prolongation, pazopanib concentrations
Simvastatin: increased plasma concentrations of this agent
Warfarin: avoid use with warfarin; use low-molecular-weight anticoagulants instead; increased plasma concentration of warfarin

### Drug classifications

Class IA/III antidysrhythmics, some phenothiazines, Beta-agonists, local anesthetics, tricyclics; CYP3A4 inhibitors (amiodarone, clarithromycin, erythromycin, telithromycin, ketoconazole, troleandomycin); CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone): increased QT prolongation, increased pazopanib concentrations
Calcium-channel blockers, ergots: increased plasma concentrations of these agents
CYP3A4 inducers (dexamethasone, phenytoin, carBAMazepine, rifampin, PHENobarbital): decreased pazopanib concentrations

### Drug/food

Grapefruit juice: avoid use; increased pazopanib effect

### Drug/herb

St. John's wort: decreased pazopanib concentration

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Hepatic disease: fatal hepatotoxicity can occur; obtain LFTs baseline and at least every 2 wk × 2 mo, then monthly

**BLACK BOX WARNING:** Fatal bleeding: from GI, respiratory, GU tracts, permanently discontinue in those with severe bleeding

- **Palmar-plantar erythrodysesthesia (hand–foot syndrome):** more common in those previously treated; assess for swelling, numbness, desquamation on palms and soles
- **GI perforation/fistula:** discontinue if this occurs, assess for pain in epigastric area, dyspepsia, flatulence, fever, chills
- **Hypertension/hypertensive crisis:** hypertension usually occurs in the first cycle; in those with preexisting hypertension, do not start treatment until B/P is controlled; monitor B/P every wk × 6 wk, then at start of each cycle or more often if needed, temporarily or permanently discontinue for severe uncontrolled hypertension
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

- Advise patient to report adverse reactions immediately: bleeding
- Teach patient about reason for treatment, expected results
- Inform patient that effect on male fertility is unknown
- Do not crush or chew tabs, take on empty stomach 1 hr before or 2 hr after meals, avoid grapefruit juice

### Evaluation

**Positive therapeutic outcome**

- Decrease in size, spread of tumor

## pegaptanib (Rx)

(peg-ap'ta-nib)
**Macugen**
*Func. class:* Ophthalmic agent—miscellaneous

**Do not confuse:** Neulasta/Lunesta/Neomega/Nuedexta

**ACTION:** Binds to vascular endothelial growth factor (VEGF), thereby inhibiting angiogenesis

**Therapeutic outcome:** Stabilization of vision in macular degeneration

**USES:** Treatment of neovascular (wet) age-related macular degeneration; may be used alone or with photodynamic therapy (PDT)

## CONTRAINDICATIONS

Hypersensitivity, ocular or periocular infections

**Precautions:** Pregnancy, inflammatory eye disease, ocular hypertension

## DOSAGE AND ROUTES

**Adult:** Intravitreal inj 0.3 mg inj q6wk

**Available forms:** Inj 0.3 mg, single glass syringes

### Implementation

- Administer anesthesia and a broad-spectrum antiinfective prior to injection
- The inj should be done under aseptic conditions
- Remove all air bubbles prior to use
- Store at 36°-46° F, do not freeze or shake vigorously

## ADVERSE EFFECTS

**EENT:** *Anterior chamber inflammation, blurred vision, conjunctival hemorrhage, corneal edema, cataract, eye discharge, eye pain, increased intraocular pressure, punctate keratitis, reduced visual acuity, vitreous floaters, vitreous opacities, blepharitis, conjunctivitis, photophobia,* retinal detachment, iatrogenic traumatic cataract

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 87-100 hr in vitreous humor of the monkey |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | May remain fully active in the eye for 7-28 days |

## NURSING CONSIDERATIONS

### Assessment

- Test visual acuity periodically
- Assess treated eye for increased intraocular pressure, infection, endophthalmitis
- Monitor perfusion of the optic nerve head immediately after injection, tonometry ½ hr after inj, biomicroscopy 2-7 days after inj

### Patient/family education

- Instruct patient to report any inflammation, bleeding, eye discharge, opacities to prescriber
- Instruct patient to continue with follow-up care during treatment

### Evaluation

**Positive therapeutic outcome**

- Macular degeneration stabilized

**⚠ HIGH ALERT**

# pegfilgrastim (Rx)

(peg-fill-grass'stim)

**Neulasta**

*Func. class.:* Hematopoietic agent

**ACTION:** Stimulates proliferation and differentiation of neutrophils

**Therapeutic outcome:** Absence of infection

**USES:** To decrease infection in patients receiving antineoplastics that are myelosuppressive; to increase WBC in patients with product-induced neutropenia

## CONTRAINDICATIONS

Hypersensitivity to proteins of *E. coli,* filgrastim

**Precautions:** Pregnancy, breastfeeding, child <45 kg, adolescents, myeloid malignancies, sickle cell disease, leukocytosis, splenic rupture, allergic-type reactions, ARDS, peripheral blood stem cell mobilization (PBSC)

## DOSAGE AND ROUTES

**Adult:** SUBCUT 6 mg per chemotherapy cycle

**Available forms:** Sol for inj 10 mg/0.6 ml

### Implementation

**SUBCUT route**

- Give using single-use vials; after dose is withdrawn, do not reenter vial
- Do not use 6-mg fixed dose in infants, children, or others <45 kg
- Inspect sol for discoloration, particulates; if present, do not use
- Do not administer in the period 14 days before and 24 hr after cytotoxic chemotherapy
- Store in refrigerator; do not freeze; may store at room temp up to 6 hr, avoid shaking, protect from light

## ADVERSE EFFECTS

**CNS:** Fever, fatigue, headache, dizziness, insomnia, peripheral edema

**GI:** *Nausea,* vomiting, diarrhea, mucositis, anorexia, constipation, dyspepsia, abdominal pain, stomatitis, splenic rupture

**HEMA:** Leukocytosis, granulocytopenia, sickle cell crisis, hemoglobin S disease with crisis
**INTEG:** Alopecia
**MISC:** Chest pain, hyperuricemia, anaphylaxis, flulike syndrome, angioedema, antibody formation
**MS:** Skeletal pain
**RESP:** Respiratory distress syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 15-80 hr; 20-38 hr (child) |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drug

Lithium: increased release of neutrophils

### Drug classifications

Cytotoxic chemotherapy agents: do not use this product concomitantly or 2 wk before or 24 hr after administration of cytotoxics

### Drug/lab test

Increased: uric acid, LDH, alkaline phosphatase

## NURSING CONSIDERATIONS

### Assessment

- **Assess for allergic reactions, anaphylaxis:** rash, urticaria; discontinue this product, have emergency equipment nearby
- Monitor blood studies: CBC, platelet count before treatment and twice weekly; neutrophil counts may be increased for 2 days after therapy
- **ARDS:** assess for dyspnea, fever, tachypnea, occasional confusion; obtain ABGs, chest x-ray, product may need to be discontinued
- Monitor B/P, respirations, pulse before, during therapy
- **Assess for bone pain,** give mild analgesics
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, pregnant patient should enroll in Amgen's Pregnancy Surveillance Program 800-772-6436, cautious use in breastfeeding, excretion unknown

### Patient/family education

- Teach the technique for self-administration: dose, side effects, disposal of containers and needles; provide instruction sheet
- Teach patient to notify prescriber immediately of allergic reaction, trouble breathing, abdominal pain

### Evaluation

**Positive therapeutic outcome**

- Absence of infection

**⚠ HIGH ALERT**

## PEMEtrexed (Rx)

(pem-ah-trex'ed)
**Alimta**
*Func. class.:* Antineoplastic-antimetabolite
*Chem. class.:* Folic acid antagonist

**ACTION:** Inhibits multiple enzymes that reduce folic acid, which is needed for cell replication

**Therapeutic outcome:** Decreased spread of mesothelioma, decreased tumor size

**USES:** Malignant pleural mesothelioma in combination with CISplatin; non–small cell lung cancer as a single agent; non-squamous non–small cell lung cancer (first-line treatment)

## CONTRAINDICATIONS

Pregnancy, hypersensitivity, ANC <1500 cells/mm$^3$, CCr <45 ml/min, thrombocytopenia (<100,000/mm$^3$), anemia

**Precautions:** Breastfeeding, children, renal/hepatic disease

## DOSAGE AND ROUTES

**Adult: IV** INF 500-600 mg/m$^2$ given over 10 min on day 1 of a 21-day cycle with CISplatin 75 mg/m$^2$ INF over 2 hr beginning ½ hr after end of PEMEtrexed INF

### Renal dose

**Adult:** IV infusion CCr <45 ml/min, not recommended

**Available forms:** Inj, single-use vials, 100, 500 mg

### Implementation

- Administer vit $B_{12}$ and low-dose folic acid as a prophylactic measure to treat related hematologic, GI toxicity; at least 5 daily doses of folic acid must be taken in the 7 days preceding first dose
- Premedicate with a corticosteroid (dexamethasone) given PO bid the day before, day of, and day after administration of PEMEtrexed
- **Neurotoxicity:** assess for CTC grade 2: withhold until resolution to at least pretherapy value/condition, reduce CISplatin by 50%; CTC grade 3/4; immediately discontinue this product and CISplatin if given in combination
- **Mucositis:** assess for CTC 3-4; withhold until resolution to at least pretherapy value/condition, reduce dose by 50%, if grade

3-4 occurs after 2 dosage reductions, discontinue this product and CISplatin
• **Bleeding:** assess for bleeding time, coagulation time during treatment; bleeding; hematuria, guaiac, bruising or petechiae, mucosa or orifices q8hr
• Use a liquid diet: carbonated beverage, gelatin; dry toast, crackers may be added when patient is not nauseated or vomiting
• Assist patient with rinsing of mouth tid-qid with water, club soda; brushing of teeth bid-tid with soft brush or cotton-tipped applicators for stomatitis; use unwaxed dental floss

**IV route**
• Use cytotoxic handling procedures
• Reconstitute 500-mg vial/20 ml 0.9% NaCl inj (preservative free) = 25 mg/ml, swirl until dissolved, further dilute with 100 ml 0.9% NaCl inj (preservative free), give as IV inf over 10 min
• Use only 0.9% NaCl inj (preservative free) for reconstitution, dilution
• Store at 77° F, excursions permitted 59°-86°F, not light sensitive, discard unused portions

**Dosage adjustments**
Do not begin a new cycle unless neutrophils (ANC) ≥1500 cells/mm$^3$, platelets ≥100,000 cells/mm$^3$, CCr is ≥45 ml/min
• **Platelet nadir <50,000/mm$^3$ regardless of the ANC:** If necessary, delay until platelet count recovery, reduce PEMEtrexed and CISplatin, by 50%; if grade 3/4 toxicity occurs after 2 reductions, discontinue both products
• **ANC nadir <500/mm$^3$ when platelet nadir is ≥50,000/mm$^3$:** If necessary, delay until ANC recovery, reduce PEMEtrexed and CISplatin, by 75%; if grade 3/4 toxicity occurs after 2 reductions, discontinue both products
• **CTC Grade 3/4 nonhematologic toxicity including diarrhea requiring hospitalization and excluding neurotoxicity, mucositis, and grade 3 transaminase elevations:** Withhold therapy until pre-therapy value or condition, reduce by 75% both products, if grade 3 or 4 toxicity occurs after 2 reductions, discontinue both products
• **CTC grade 3/4 mucositis:** Withhold therapy until pre-therapy condition, reduce 50% of PEMEtrexed, if grade 3 or 4 mucositis occurs after 2 dosage reductions, discontinue both products
• **CTC grade 2 neurotoxicity:** Withhold therapy until pre-therapy value or condition, reduce dose of CISplatin by 50%
• **CTC grade 3/4 neurotoxicity:** discontinue both products

**Y-site compatibilities:** Acyclovir sodium, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amiodarone, amphotericin B lipid complex, amphotericin B liposome, ampicillin, ampicillin-sulbactam, atenolol, atracurium, azithromycin, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, CARBOplatin, carmustine, ceftizoxime, cefTRIAXone, cefuroxime, cimetidine, cisatracurium, CISplatin, clindamycin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, digoxin, diltiazem, diphenhydrAMINE, DOCEtaxel, dolasetron, DOPamine, doxacurium, enalaprilat, ePHEDrine, EPINEPHrine, eptifibatide, ertapenem, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, foscarnet, fosphenytoin, furosemide, ganciclovir, gatifloxacin, glycopyrrolate, granisetron, haloperidol, heparin, hydrocortisone, HYDROmorphone, hydrOXYzine, ifosfamide, imipenem-cilastatin, insulin (regular), isoproterenol, ketorolac, labetalol, leucovorin, levofloxacin, lidocaine, linezolid, LORazepam, magnesium, mannitol, meperidine, meropenem, mesna, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, midazolam, milrinone, mitoMYcin, mivacurium, morphine, moxifloxacin, nafcillin, naloxone, nesiritide, nitroglycerin, norepinephrine, octreotide, oxaliplatin, PACLitaxel, pamidronate, pancuronium, PENTobarbital, PHENobarbital, piperacillin-tazobactam, polymyxin B, potassium chloride/phosphates, procainamide, promethazine, propranolol, ranitidine, remifentanil, rocuronium, sodium acetate/bicarbonate/phosphates, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, tacrolimus, theophylline, thiopental, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, trimethobenzamide, vancomycin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CNS:** *Fatigue, fever, mood alteration, neuropathy*
**CV:** Thrombosis/embolism, *chest pain*, arrhythmia exacerbation
**GI:** *Nausea, vomiting, anorexia, diarrhea, ulcerative stomatitis, constipation, dysphagia, dehydration*
**GU:** Renal failure, *creatinine elevation*
**HEMA:** Neutropenia, leukopenia, thrombocytopenia, myelosuppression, anemia
**INTEG:** *Rash, desquamation*
**RESP:** *Dyspnea*
**SYST:** Infection with/without neutropenia, radiation recall reaction

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 81% protein binding |
| **Metabolism** | Not metabolized |
| **Excretion** | Excreted in urine (unchanged 70%-90%)Not known if it is excreted in breast milk |
| **Half-life** | 3.5 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Drug classifications

Anticoagulants, NSAIDs, platelet inhibitors, salicylates, thrombolytics: increased bleeding risk

Nephrotoxic products (NSAIDs): decreased PEMEtrexed clearance

## NURSING CONSIDERATIONS

### Assessment

- **Bone marrow depression:** monitor CBC, differential, platelet count; monitor for nadir and recovery; a new cycle should not begin if ANC < 1500 cells/mm$^3$, platelets are < 100,000 cells/mm$^3$, creatinine clearance < 45 ml/min
- Monitor renal tests: BUN, serum uric acid, urine CCr, electrolytes before, during therapy
- For previous radiation treatments; radiation recall reactions have occurred (erythema, exfoliative dermatitis, pain, burning)
- Monitor I&O ratio; report fall in urine output to <30 ml/hr
- Monitor temp q4hr; fever may indicate beginning infection; no rectal temps
- Assess bleeding time, coagulation time during treatment; bleeding: hematuria, guaiac, bruising or petechiae, mucosa or orifices q8hr
- Assess buccal cavity q8hr for dryness, sores, ulceration, white patches, oral pain, bleeding, dysphagia
- **Assess for symptoms indicating severe allergic reaction/toxic epidermal necrolysis:** rash, urticaria, itching, flushing
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

- Instruct patient to report any complaints, side effects to nurse or prescriber: black tarry stools, chills, fever, sore throat, bleeding, bruising, cough, shortness of breath, dark or bloody urine
- Instruct patient to avoid foods with citric acid, hot or rough texture if stomatitis is present
- Instruct patient to report stomatitis: any bleeding, white spots, ulcerations in mouth to prescriber; tell patient to examine mouth daily, report symptoms to nurse, use good oral hygiene
- Advise patient that contraceptive measures are recommended during therapy and for at least 8 wk following cessation of therapy, to discontinue breastfeeding; toxicity to infant may occur
- Advise patient to avoid alcohol, salicylates, live vaccines
- Advise patient to avoid use of razors, commercial mouthwash
- Teach to eat foods high in folic acid and take supplements as prescribed

### Evaluation

**Positive therapeutic outcome**

- Decreased spread of malignancy

**⚠ HIGH ALERT**

## pembrolizumab

(pem'broe-liz'ue-mab)

**Keytruda**

*Func. class.:* Antineoplastic, biologic response modifier

*Chem. class.:* Monoclonal antibody

**ACTION:** A human monoclonal antibody that binds to the programmed death receptor-1 (PD-1) found on T cells and blocks the interaction of PD-1 with its ligands, PD-L1 and PD-L2, on the tumor cell

**Therapeutic outcome:** Decreased progression of multiple myeloma

**USES:** Treatment of unresectable or metastatic malignant melanoma in those who have disease progression after ipilimumab or in BRAF V600 mutation–positive patients who have disease progression after ipilimumab and a BRAF inhibitor

**CONTRAINDICATIONS:** Hypersensitivity, pregnancy, breastfeeding

**Precautions:** Immune-mediated colitis, immune-mediated hepatitis, immune-mediated hyperthyroidism/hypothyroidism; immune-mediated nephritis, acute interstitial nephritis, and renal failure; immune-mediated pneumonitis, adrenocortical insufficiency, arthritis, exfoliative dermatitis, hemolytic anemia, hypophysitis, myasthenia syndrome, myositis, optic neuritis, pancreatitis, partial seizures after inflammatory foci identified in brain parenchyma, rhabdomyolysis, uveitis, incidence of abortion/stillbirths

P

## DOSAGE AND ROUTES

**Adult: IV** INF: 200mg over 30 min q3wk until disease progression

**Available forms:** Powder for injection 50 mg

### Implementation

**IV INF route**

- Add 2.3 ml of sterile water for injection, 50-mg vial (25 mg/ml); inject sterile water along the walls of the vial and not directly on the powder
- Gently swirl and allow up to 5 min for bubbles to clear, do not shake, solution will be clear to slightly opalescent, colorless to slightly yellow
- Add the required amount of product to a bag of normal saline (0.9% sodium chloride injection) to a final diluted concentration between 1 and 10 mg/ml; mix by gentle inversion
- Discard any unused solution left in the vial
- Storage after reconstitution and dilution: Store at room temperature up to 4 hr or refrigerate up to 24 hr (includes reconstitution, dilution, and administration time). If refrigerated, allow the diluted solution to warm to room temperature before use, give over 30 min.
- Use a sterile, nonpyrogenic, low-protein binding 0.2- to 5-micron in-line or add-on filter
- Do not use with other drugs through the same infusion line
- **Grade 2 or 3 toxicity:** Withhold and give corticosteroids; resume when the adverse event recovers to grade ≤1. Permanently discontinue if there is no recovery within 12 wk, if the corticosteroid dose cannot be reduced to ≤10 mg/day of predniSONE (or equivalent) within 12 wk, or for recurrent severe or grade 3 colitis.
- **Grade 4 toxicity:** Permanently discontinue, give corticosteroids

**Hepatitis:**

- **Grade 2 toxicity (AST or ALT >3-5 × upper limit of normal [ULN] or total bilirubin >1.5-3 × ULN):** Withhold and give corticosteroids; resume when adverse event recovers to grade 1 or less. Permanently discontinue if there is no recovery within 12 wks or if the corticosteroid dose cannot be reduced to ≤10 mg/day of predniSONE (or equivalent) within 12 wks.
- **Grade 3 or 4 toxicity (AST or ALT >5 × ULN or total bilirubin >3 × ULN):** Permanently discontinue, give corticosteroids
- **Liver metastases and grade 2 elevated transaminase levels at baseline:** Permanently discontinue if AST/ALT levels increase by ≥50% over baseline and transaminase level elevations persist for at least 1 wk

## ADVERSE EFFECTS

**CNS:** Seizures, myasthenia gravis, headache, fever, insomnia, chills, dizziness, fatigue
**EENT:** Optic neuritis
**ENDO:** Hyponatremia, hypothyroidism/hyperthyroidism, hyperglycemia, hypocalcemia immune-mediated hypophysitis
**GI:** Nausea, vomiting, abdominal pain, pancreatitis, colitis, diarrhea, hepatitis, constipation
**GU:** Interstitial nephritis, renal failure
**INTEG:** Rash, pruritus, skin discoloration
**MS:** Myalgia, immune-mediated rhabdomyolysis
**RESP:** Cough, dyspnea, pneumonitis
**SYST:** Exfoliative dermatitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Drug/lab test

Increased: LFTs, renal function studies

## NURSING CONSIDERATIONS

### Assessment

- **Hyperglycemia:** May cause diabetes mellitus type 1 or diabetic ketoacidosis
- For hyperthyroidism/hypothyroidism, renal function studies baseline, periodically during therapy, CCr, BUN, monitor for nephritis
- For pneumonitis (new or worsening cough, chest pain, shortness of breath), confirm with radiographic imaging
- **Immune-mediated hepatitis:** Liver function tests and hepatitis (e.g., jaundice, severe nausea/vomiting, easy bleeding or bruising; withhold and give corticosteroids if grade 2 hepatitis (AST or ALT >3-5 × ULN or total bilirubin >1.5-3 × ULN)
- **Pregnancy:** Assess if pregnancy is planned or suspected, if breastfeeding

### Patient/family education

- Instruct patient to use highly effective contraceptive methods during and for 4 months after treatment, to contact their health care provider if pregnancy is suspected or confirmed

- Teach patient to notify prescriber immediately of signs of colitis, pneumonitis, hepatitis, hypophysitis
- **Hyperglycemia:** Teach about signs and symptoms of hyperglycemia, diabetes, ensure right glucose control, report
- Teach patient that prophylactic folic acid and $B_{12}$ injections may be necessary 1 wk before therapy to prevent bone marrow suppression and GI symptoms
- **Immune-mediated hypophysitis:** Headache, weakness, fainting, dizziness, blurred vision, use corticosteroid if >grade 2, discontinue if >grade 3

### Evaluation

**Positive therapeutic outcome**
- Decreased progression of multiple myeloma

## penciclovir topical

*See Appendix B*

## PENICILLINS

## penicillin G benzathine (Rx)

(pen-i-sill'in)
**Bicillin L-A**

## penicillin G Potassium (Rx)

**Pfizerpen**

## penicillin G procaine (Rx)

## penicillin V (Rx)

**Apo-Pen-VK** 🍁, **Penicillin VK**

*Func. class.:* Broad-spectrum antiinfective
*Chem. class.:* Natural penicillin

**ACTION:** Interferes with cell wall replication of susceptible organisms; osmotically unstable cell wall swells and bursts from osmotic pressure, resulting in cell death

**Therapeutic outcome:** Bactericidal effects on the gram-positive cocci *Staphylococcus, Streptococcus pyogenes, Streptococcus viridans, Streptococcus faecalis, Streptococcus bovis, Streptococcus pneumoniae;* gram-negative cocci *Neisseria gonorrhoeae;* gram-positive bacilli *Actinomyces, Bacillus anthracis, Clostridium perfringens, Clostridium tetani, Corynebacterium diphtheriae, Listeria monocytogenes;* gram-negative bacilli *Escherichia coli, Proteus mirabilis, Salmonella, Shigella, Enterobacter, Streptobacillus moniliformis;* spirochete *Treponema pallidum*

**USES:** Respiratory tract infections, scarlet fever, erysipelas, otitis media, pneumonia, skin and soft tissue infections, gonorrhea

## CONTRAINDICATIONS

Hypersensitivity to penicillins, corn

**Precautions:** Pregnancy, breastfeeding, hypersensitivity to cephalosporins/carbapenem/sulfite, severe renal disease, GI disease, asthma

**BLACK BOX WARNING:** Penicillin G benzathine: IV use

## DOSAGE AND ROUTES

### >> Penicillin G benzathine

**Early syphilis**
**Adult:** IM 2.4 million units in single dose

**Congenital syphilis**
**Child <2 yr:** IM 50,000 units/kg in single dose, max 2.4 million units as a single inj

**Prophylaxis of rheumatic fever, glomerulonephritis**
**Adult and child:** IM 1.2 million units in single dose

**Upper respiratory tract infections (group A streptococcal)**
**Adult:** IM 1.2 million units in single dose
**Child >27 kg:** IM 900,000 units in single dose
**Child <27 kg:** IM 300,000-600,000 units in single dose

**Available forms:** Inj 300,000 units/ml; 600,000 units/ml

### >> Penicillin G

**Pneumococcal/streptococcal infections (serious)**
**Adult:** IM/IV 5-24 million units in divided doses q4-6hr
**Child <12 yr:** IV 150,000-300,000 units/kg/day in 4-6 divided doses; max 24 million units/day

**Renal dose**
CCr <10 ml/min, give full loading dose, then ½ of loading dose q8-10hr

**Available forms:** Inj 1, 2, 3 million units/50 ml; powder for inj 1, 5, 20 million units/vial

### >> Penicillin G procaine

**Moderate to severe pneumococcal infections**
**Adult and child:** IM 600,000-1.2 million units in 1 or 2 doses/day for 10 days to 2 wk
**Newborn:** Avoid use in newborns

**Pneumococcal pneumonia**
**Adult and child >12 yr:** IM 600,000-1.2 million units/day × 7-10 days

**Available forms:** Inj 600,000, 1,200,000 units/dose

### Moderately severe group A streptococcal/staphylococcal pneumonia

**Adult, adolescent, child ≥60 lb:** IM 600,000-1 million units/day

**Adolescent and child <60 lb:** IM 300,000 units/day

## >> Penicillin V

### Pneumococcal/staphylococcal infections

**Adult:** PO 250-500 mg q6hr

**Child <12 yr/adolescent/child >12 yr:** PO 25-50 mg/kg/day in divided doses q6-8hr, max 3 g/day

### Streptococcal infections

**Adult/adolescent/child >12 yr:** PO 125 mg q6-8hr × 10 days

**Child <12 yr and >27 kg:** PO 500 mg q8hr or 12hr × 10 days

**Child <12 yr and ≤27 kg:** PO 250 mg q8hr or q12hr or 40 mg/kg/day in 3 divided doses × 10 days

### Prevention of recurrence of rheumatic fever/chorea

**Adult:** PO 125-250 mg bid continuously

### Vincent's gingivitis/pharyngitis

**Adult:** PO 250 mg q6-8hr

## Renal dose

CCr <50 ml/min dosage reduction indicated based on clinical response, degree of impairment

**Available forms:** Tabs 250, 500 mg; powder for oral sol 125, 250 mg/5 ml

## Implementation

## >> Penicillin G benzathine

**IM route**

- No dilution needed, shake well, give deeply IM in large muscle mass, avoid intravascular inj; aspirate; do not give **IV**

## >> Penicillin G

- Penicillin G sodium or potassium can be given IM or IV, vials containing 10 or 20 million units are not for IM use

**Intermittent IV infusion route**

- Vials/bulk packages; dilute according to manufacturer's directions
- Frozen bags: thaw at room temp, do not force thaw, no reconstitution needed
- Final conc (100,000-500,000 units/ml, adults; 50,000 units/ml, neonate/infant)
- Total daily dose divided q4-6hr and given over 1-2 hr (adult), 15 min (infant/neonate)

## >> Penicillin G potassium

**Y-site compatibilities:** Acyclovir, amiodarone, aztreonam, atropine, benztropine, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, ceFAZolin, cefTRIAXone, cefuroxime, chloramphenicol, clindamycin, cyclophosphamide, diltiazem, enalaprilat, esmolol, fluconazole, foscarnet, heparin, HYDROmorphone, labetalol, magnesium sulfate, meperidine, morphine, perphenazine, potassium chloride, tacrolimus, theophylline, verapamil, vit B/C

## >> Penicillin G procaine

- No dilution needed, give deep IM inj; avoid intravascular inj; aspirate; do not give IV
- Do not give **IV**
- Give deeply in large muscle mass
- Reconstitute with 0.9% NaCl, sterile water for inj, $D_5W$; refrigerate unused portion
- Shake medication before administering
- IM route may include procaine reactions: fear of death, depression, seizures, anxiety, confusion, hallucinations

## >> Penicillin V

- Orally on empty stomach for best absorption
- Oral susp: tap bottle to loosen, add ½ total amount of water, shake, add remaining water, shake; final conc (125 or 250); store in refrigerator after reconstitution, discard after 14 days
- Give in even doses around the clock; if GI upset occurs, give with food; product must be given for 10-14 days to ensure organism death and prevent superinfection; store in tight container
- Shake susp; store in refrigerator for 2 wk or for 1 wk at room temperature

## ADVERSE EFFECTS

**CNS:** Lethargy, hallucinations, anxiety, depression, twitching, coma, seizures, hyperreflexia

**GI:** *Nausea, vomiting, diarrhea,* increased AST, ALT, abdominal pain, glossitis, colitis, pseudomembranous colitis

**GU:** Oliguria, proteinuria, hematuria, *vaginitis, moniliasis,* glomerulonephritis, renal tubular damage

**HEMA:** Anemia, increased bleeding time, bone marrow depression, granulocytopenia, hemolytic anemia

**META:** Hyperkalemia, hypokalemia, alkalosis, hypernatremia

**MISC:** Local pain, tenderness and fever with IM inj, anaphylaxis serum sickness, Stevens-Johnson syndrome

### >> Penicillin G benzathine

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Delayed; prolonged drug levels |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Liver, minimally |
| **Excretion** | Kidneys, unchanged; breast milk |
| **Half-life** | ½-1 hr |

#### Pharmacodynamics

| | |
|---|---|
| **Onset** | Slow |
| **Peak** | 12-24 hr |
| **Duration** | 1-4 wk |

### >> Penicillin G

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Variably absorbed (PO); well absorbed (IM) |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Liver, minimally |
| **Excretion** | Kidneys, unchanged; breast milk |
| **Half-life** | ½-1 hr |

#### Pharmacodynamics

| | PO | IM | IV |
|---|---|---|---|
| **Onset** | Rapid | Rapid | Rapid |
| **Peak** | 1 hr | ¼-½ hr | Immediate |
| **Duration** | Unknown | Unknown | Unknown |

### >> Penicillin G procaine

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Delayed; prolonged drug levels |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Liver, minimally |
| **Excretion** | Kidneys, unchanged; breast milk |
| **Half-life** | ½-1 hr |

#### Pharmacodynamics

| | |
|---|---|
| **Onset** | Slow |
| **Peak** | 1-4 hr |
| **Duration** | 15 hr |

### >> Penicillin V

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Widely absorbed |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Liver, minimally |
| **Excretion** | Kidneys, unchanged; breast milk |
| **Half-life** | ½-1 hr |

#### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | ½ hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Aspirin, probenecid: increased penicillin levels
Heparin: increased effect of heparin
Methotrexate: increased effect of methotrexate
Typhoid vaccine: decreased effect of toxoid vaccine

### Drug classifications

Contraceptives (oral): decreased contraceptive effectiveness
Tetracyclines: decreased antimicrobial effectiveness of penicillin

### Drug/lab test

False positive: urine glucose, urine protein

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for previous sensitivity reaction to penicillins or cephalosporins; cross-sensitivity between penicillins and cephalosporins is common
- **Assess patient for signs and symptoms of infection** including characteristics of wounds, sputum, urine, stool, WBC >10,000/mm$^3$, earache, fever; obtain information baseline, during treatment
- Obtain C&S before beginning drug therapy to identify if correct treatment has been initiated
- **Assess for allergic reactions:** rash, urticaria, pruritus, chills, fever, joint pain; angioedema may occur a few days after therapy begins; EPINEPHrine, resuscitation equipment should be available for anaphylactic reaction
- **Pseudomembranous colitis:** Assess for diarrhea, abdominal pain, fever, fatigue, anorexia; possible anemia, elevated WBC and low serum albumin; stop product and usually give either vancomycin or IV metroNIDAZOLE

• Identify urine output; if decreasing, notify prescriber (may indicate nephrotoxicity); also check for increased BUN, creatinine
• Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test monthly if patient is on long-term therapy
• Monitor electrolytes: potassium, sodium, chloride monthly if patient is on long-term therapy
• Assess bowel pattern daily; if severe diarrhea occurs, product should be discontinued; may indicate pseudomembranous colitis
• Monitor for bleeding: ecchymosis, bleeding gums, hematuria, stool guaiac daily if on long-term therapy
• **Assess for overgrowth of infection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum

### Patient/family education

• Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate **blood dyscrasias (rare)**; CNS effects: depression, hallucinations, seizures
• Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate **superinfection**
• Instruct patient to take all medication prescribed for the length of time ordered
• Advise patient to notify prescriber of diarrhea with blood or pus, which may indicate pseudomembranous colitis
• **Pregnancy:** May decrease effect of hormonal contraceptives, advise another form of contraception
• **Sexually transmitted infection:** All partners must be notified and treated
• **Suspension:** Teach patient to shake suspension well before each dose, store in refrigerator for up to 2 wk

### Evaluation

**Positive therapeutic outcome**
• Absence of signs/symptoms of infection (WBC $<10{,}000/mm^3$, temp WNL, absence of red, draining wounds, earache)
• Reported improvement in symptoms of infection

**TREATMENT OF ANAPHYLAXIS:** Withdraw product, maintain airway, administer EPINEPHrine, SUBCUT × 3 doses, followed by an epinephrine drip, $O_2$, **IV** corticosteroids, inhaled bronchodilator

## pentamidine (Rx)

(pen-tam'i-deen)
**Nebupent, Pentam**
*Func. class.:* Antiprotozoal
*Chem. class.:* Aromatic diamide derivative

**ACTION:** Interferes with DNA/RNA synthesis in protozoa; has direct effect on islet cells in the pancreas

**Therapeutic outcome:** Protozoa death

**USES:** Treatment/prevention of *Pneumocystis jiroveci* infections

**Unlabeled uses:** Leishmaniasis, African trypanosomiasis

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, blood dyscrasias, cardiac/renal/hepatic disease, diabetes mellitus, hypocalcemia, hyper/hypotension, anemia

## DOSAGE AND ROUTES

**Adult and child ≥4 mo: IV/IM** 4 mg/kg/day × 2-3 wk; NEB 300 mg via specific nebulizer given q4wk for prevention

**Available forms:** Inj; aerosol 300 mg/vial; sol for aerosol 60 mg/vial

### Implementation

**Inhalation route**
• Through nebulizer, using Respirgard II jet nebulizer; mix contents in 6 ml of sterile water; do not use low pressure (<20 psi); flow rate should be 5-7 L/min (40-50 psi) air or $O_2$ source over 30-45 min until chamber is empty

**IM route**
• 300 mg diluted in 3 ml sterile water; give deep IM by Z-track; painful by this route, rotate inj site

**Intermittent IV infusion route**
• 300 mg/3-5 ml of sterile water for inj, $D_5W$; withdraw dose and further dilute in 50-250 ml of $D_5W$; diluted sol is stable for 48 hr; discard unused sol; give over 1 hr or more

**Y-site compatibilities:** alemtuzumab Alfentanil, aminocaproic acid, anidulafungin, argatroban atracurium, atropine, benztropine, buprenorphine, calcium gluconate, CARBOplatin, caspofungin, chlorpromazine, cimetidine, CISplatin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, diltiazem, gatifloxacin, zidovudine

**Y-site incompatibilities:** Foscarnet, fluconazole

## ADVERSE EFFECTS

**CNS:** Disorientation, hallucinations, dizziness, confusion, drowsiness
**CV:** Hypotension, ventricular tachycardia, QT prolongation, dysrhythmias
**GI:** *Nausea, vomiting, anorexia,* increased AST, ALT, acute pancreatitis, metallic taste
**GU:** Acute renal failure, increased serum creatinine, renal toxicity, decreased urination
**HEMA:** Anemia, leukopenia, thrombocytopenia
**INTEG:** Sterile abscess, pain at inj site, pruritus, urticaria, rash
**META:** Hyperkalemia, hypocalcemia, *hypoglycemia,* hypomagnesemia
**MISC:** Fatigue, fever, chills, night sweats, anaphylaxis, Stevens-Johnson syndrome
**RESP:** Cough, shortness of breath, bronchospasm (with aerosol), sore throat

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (IM); minimally absorbed (INH); completely absorbed (**IV**) |
| **Distribution** | Widely distributed; does not appear in CSF |
| **Metabolism** | Not known |
| **Excretion** | Kidneys, unchanged (up to 30%) |
| **Half-life** | 6½-9½ hr; increased in renal disease |

### Pharmacodynamics

| | IM | IV | INH |
|---|---|---|---|
| **Onset** | Unknown | Unknown | Unknown |
| **Peak** | ½-1 hr | Inf end | Unknown |
| **Duration** | Unknown | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Amphotericin B, CISplatin, vancomycin: increased nephrotoxicity
Erythromycin IV: fatal dysrhythmias
Haloperidol, chloroquine, droperidol, pentamidine; arsenic trioxide, levomethadyl: increased QT prolongation
Radiation: bone marrow suppression

### Drug classifications

Aminoglycosides NSAIDs: increased nephrotoxicity
Antineoplastics: increased bone marrow depression
Class IA/III antidysrhythmics, some phenothiazines, β-agonists, local anesthetics, tricyclics, CYP3A4 inhibitors (amiodarone, clarithromycin, erythromycin, telithromycin, troleandomycin), CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone): increased QT prolongation

### Drug/lab test

Decrease: WBC, platelets, Hbg, Hct
Increase: BUN, creatinine potassium, LFTs

## NURSING CONSIDERATIONS

### Assessment

- **Assess any patient with compromised renal system:** product is excreted slowly in poor renal system function; toxicity may occur rapidly
- **QT prolongation:** ECG for QT prolongation, ejection fraction; assess for chest pain, palpitations, dyspnea
- **Assess patient for infection,** including increased temp, thick sputum, WBC >10,000/mm$^3$; monitor these signs of infection throughout treatment; obtain C&S before beginning therapy; treatment may begin after culture is obtained
- Assess respiratory system including rate, rhythm, bilateral lung sounds, SOB, wheezing, dyspnea
- **Serious skin reactions:** Assess for rash, fever, fatigue, muscle/joint aches, oral lesions, blisters, discontinue product immediately if these occur
- **Pancreatitis:** Assess for nausea, vomiting, severe abdominal pain, monitor the lab values of lipase/amylase that will be elevated, if these occur product may need to be discontinued
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding
- Monitor ECG for cardiac dysrhythmias; ECG and pulse should be checked frequently during treatment, since cardiotoxicity can occur
- Assess for hypoglycemia including nausea, tremors, anxiety, chills, diaphoresis, headache, hunger, cold, pale skin; this side effect can last for several mo after treatment is completed
- Monitor for hyperglycemia including flushed, dry skin, acetone breath, thirst, anorexia, drowsiness, polyuria; this side effect can last for several mo after treatment is completed
- Monitor renal function tests including BUN, urinalysis, creatinine; obtain at baseline and frequently during treatment; nephrotoxicity may occur; check I&O, report hematuria, oliguria

P

• Monitor blood studies including blood glucose, CBC, platelets; blood glucose fluctuations are common; anemia, leukopenia, thrombocytopenia can occur
• Monitor liver function studies including AST, ALT, alkaline phosphatase, bilirubin before beginning treatment and every 3 days during therapy
• Monitor calcium and magnesium before beginning treatment and every 3 days during therapy; hypocalcemia may occur

### Patient/family education

• Teach patient to report sore throat, fever, fatigue; could indicate superinfection
• Advise patient not to drink alcohol or take aspirin, since gastric bleeding may occur
• Teach patient to make position changes slowly to prevent orthostatic hypotension
• Advise patient to maintain adequate fluid intake
• Teach patient to complete entire course of medication

### Evaluation

**Positive therapeutic outcome**
• Decreased signs and symptoms of protozoan infections
• Decreased signs and symptoms of *P. jiroveci* pneumonia in HIV infections

**RARELY USED**

## pentazocine (Rx)

(pen-taz′oh-seen)
**Talwin, Talwin NX**
*Func. class.:* Opiate analgesic
*Chem. class.:* Synthetic benzomorphan (agonist/antagonist)
**Controlled substance schedule IV**

**USES:** Moderate to severe pain

### CONTRAINDICATIONS

Hypersensitivity to this product or sulfites, addiction (opioid)

### DOSAGE AND ROUTES

**Adult: IV**/IM/SUBCUT 30 mg q3-4hr prn, max 360 mg/day

#### Labor

**Adult:** IM 30 mg as a single dose; **IV** 20 mg q2-3hr when contractions are regular, max 2-3 times

#### Renal dose

**Adult:** CCr 10-50 ml/min reduce dose by 25%; CCr <10 ml/min reduce dose by 50%

## peramivir

(per-am′i-vir)
**Rapivab**
*Func. class.:* Antiviral

**ACTION:** Competitively binds to the active site of the influenza virus, inhibits the activity of strains of influenza A and B viruses

**Therapeutic outcome:** Absence of developing influenza A or B

**USES:** Treatment of uncomplicated acute influenza (seasonal influenza A virus infection or seasonal influenza B virus infection)

**Unlabeled uses:** Treatment of H1N1 influenza A virus (swine influenza) infection in pediatric patients requiring hospitalization

### CONTRAINDICATIONS:

Hypersensitivity

**Precautions:** Breastfeeding, children, dialysis, infants, infection, pregnancy, psychosis, renal impairment

### DOSAGE AND ROUTES

#### Influenza

**Adult: IV** 600 mg as a single dose infused over 15-30 min, give within 48 hr of onset of influenza symptoms

**Available forms:** Solution for injection 200 mg/20 ml

#### Implementation

• For IV use only, do not give IM, visually inspect parenteral products for particulate matter and discoloration
• Dilute the 10 mg/ml to a max volume of 100 ml, use only 0.9% or 0.45% NaCl, 5% dextrose, or LR
• Storage of diluted solution: Use immediately or refrigerate up to 24 hr. Refrigerated solution should be allowed to reach room temperature before administration. Discard any unused diluted solution after 24 hr.
• Give over 15-30 min, do not mix or coadminister with other IV products

### ADVERSE EFFECTS

**CNS:** Delirium, psychosis, hallucinations, insomnia
**GI:** Constipation, diarrhea, vomiting
**MISC:** Rash, Stevens-Johnson syndrome

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding <30% |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications:

Intranasal influenza vaccines, H1N1 vaccines: avoid concurrent use

## NURSING CONSIDERATIONS

### Assessment

- Assess for hypersensitivity reactions/Stevens-Johnson syndrome
- Neuropsychiatric reactions: Assess for delirium, psychosis, hallucinations
- **Pregnancy/breastfeeding:** Use only if clearly needed

### Patient/family education

- Teach patient that product is only for use within 48 hr of symptoms

### Evaluation

**Therapeutic response**

Absence of developing influenza A or B

**⚠ HIGH ALERT**

# pertuzumab

(per-too′zoo-mab)

**Perjeta**

*Func. class.:* Antineoplastic biologic response modifier

*Chem. class.:* Monoclonal antibody, antineoplastic

**ACTION:** Blocks liquid-dependent action of human epidermal growth factor-2 (HER2), inhibiting signal pathways

**Therapeutic outcome:** Decreased size, spread of tumor

**USES:** First-line treatment of (HER2) positive metastatic breast cancer with trastuzumab and DOCEtaxel

## CONTRAINDICATIONS

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Breastfeeding, children, infants, neonates, cardiac arrhythmias, MI, cardiac disease, heart failure, hypertension, infusion-related reactions, Asian patients

**BLACK BOX WARNING:** Heart failure, ventricular dysfunction

## DOSAGE AND ROUTES

**Adult: IV** 840 mg over 60 min, then after 3 wk 420 mg over 30–60 min every 3 wk; give with trastuzumab 8 mg/kg IV over 90 min, then after 3 wk 6 mg/kg over 30–90 min every 3 wk and DOCEtaxel 75 mg/m 2 IV every 3 wk; dosage may be escalated to 100 mg/m$^2$

**Available forms:** Solution for inj 420 mg/14 ml (single-use vials)

### Implementation

- Visually inspect for particulate matter and discoloration

**Dilution and preparation**

- Withdraw the calculated dose from the vial and add to a 250 ml 0.9% sodium chloride to PVC or non-PVC polyolefin infusion bag; do not dilute with dextrose 5% solution
- Dilute in normal saline only; do not mix or dilute with other drugs or dextrose solutions
- Mix the diluted solution by gentle inversion; do not shake

**IV infusion**

- Administer the diluted solution immediately
- Do not administer as an IV push or bolus
- Give the first dose of 840 mg over 60 min and subsequent 420-mg doses over 30–60 min
- If the diluted solution is not used immediately, store at 2°–8° C for up to 24 hr

**Delayed or missed doses**

- If time since previous dose is 6 wk, give 420 mg IV (do not wait for next scheduled dose)
- If time since previous dose is 6 wk, give 840 mg IV over 60 min, followed 3 wk later by 420 mg IV over 30–60 min repeated every 3 wk
- If DOCEtaxel is discontinued, this product and trastuzumab may continue

## ADVERSE EFFECTS

**CNS: Headache, fever, peripheral neuropathy,** chills, **fatigue, asthenia, dizziness**
**CV:** Heart failure
**EENT:** Lacrimation, **stomatitis**
**GI: Nausea, vomiting, diarrhea,** dysgeusia, anorexia, constipation
**HEMA:** Anemia, neutropenia, arthralgia
**RESP:** Upper respiratory infection, cough
**SYST:** Anaphylaxis, antibody formation
**INTEG:** *Alopecia*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Median 18 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## NURSING CONSIDERATIONS

### Assessment

• **HER2 overexpression**: Testing should be done to identify HER2 overexpression before using this product

• **Decreased left ventricular ejection fraction (LVEF):** Can occur and is increased in those with a history of prior anthracycline use or radiotherapy to the chest; evaluate LVEF at baseline and every 3 mo; withhold therapy × 3 wk if LVEF is <40% or LVEF is 40%–45% with a 10% or greater absolute decrease from baseline; resume therapy if the LVEF is recovered to >45% or to 40%–45% with <10% absolute decrease at reassessment; if the LVEF has not improved or has declined further, consider permanently discontinuing pertuzumab and trastuzumab after a risk/benefit assessment

• **Infusion-related reactions/hypersensitivity:** Assess anaphylactoid reaction, acute infusion reaction, cytokine-release syndrome 60 min after the first infusion, 30 min after other infusions; monitor for pyrexia, chills, fatigue, headache, asthenia, hypersensitivity, and vomiting; if a significant reaction occurs, slow or interrupt the infusion; permanent discontinuation may be needed in severe reactions

**BLACK BOX WARNING: Pregnancy:** Determine if pregnancy is planned or suspected; patients who become pregnant during therapy should report exposure to the Genentech Adverse Event line at 888-835-2555 and enroll in the MOTHER pregnancy registry at 800-690-6720

• **Neutropenia:** Can occur, but occurs more commonly when trastuzumab is also used and in Asian patients

• Upper respiratory infection: Monitor for dyspnea, shortness of breath, fever

### Patient/family education

**BLACK BOX WARNING:** Counsel women of childbearing age on the need for contraception during and for 6 mo after therapy; advise patients who suspect pregnancy to contact their health care provider immediately; discontinue breastfeeding

• Teach patient to notify prescriber immediately of infection: cough, fever, chills, sore throat

• Teach patient to avoid all OTC, Rx, herbals, supplements unless approved by prescriber, not to use aspirin, NSAIDs, alcohol

• Teach patient to notify prescriber of peripheral neuropathy

• Hair loss is common

### Evaluation

**Positive therapeutic outcome**

• Decreased size, spread of tumor

## phenylephrine nasal agent

*See Appendix B*

## phenylephrine ophthalmic

*See Appendix B*

## phenytoin (Rx)

(fen′i-toyn)

**Dilantin, Dilantin Infatabs, Mebroin, Phenytek, Tremytoine**

*Func. class.:* Anticonvulsant/antidysrhythmic (class IB)

*Chem. class.:* Hydantoin

**ACTION:** Inhibits spread of seizure activity in motor cortex by altering ion transport; increases AV conduction to decrease dysrhythmias

**Therapeutic outcome:** Decreased seizures, absence of dysrhythmias

**USES:** Generalized tonic-clonic seizures, status epilepticus, nonepileptic seizures associated with Reye's syndrome or after head trauma, complex/partial seizures

## CONTRAINDICATIONS

Pregnancy, hypersensitivity, psychiatric condition, bradycardia, SA and AV block, Stokes-Adams syndrome

**Precautions:** Geriatric, allergies, renal/hepatic disease, petit mal seizures, hypotension, myocardial insufficiency, Asian patients positive for HLA-B 1502, hepatic failure, acute intermittent porphyria

**BLACK BOX WARNING:** IV use

## DOSAGE AND ROUTES

### Seizures

**Adult:** PO 15-20 mg/kg (EXT REL) in 3-4 divided doses given q2hr or 400 mg, then 300 mg q2hr × 2 doses, maintenance 4-7 mg/kg/day; max 600 mg/day; **IV** 15-20 mg/kg, max 25-50 mg/min then 100 mg q6-8hr

**Child:** PO 5 mg/kg/day in 2-3 divided doses, maintenance 4-8 mg/kg/day in 2-3 divided

doses, max 300 mg/day; **IV** 15-20 mg/kg at 1-3 mg/kg/min

### Status epilepticus

**Adult:** **IV** 15-20 mg/kg, max 25-50 mg/min; may give 100 mg q6-8hr thereafter
**Child:** **IV** 15-20 mg/kg, max in divided doses 1-3 mg/kg/min

### Ventricular dysrhythmias

**Adult:** PO loading dose 1 g divided over 24 hr, then 500 mg/day × 2 days; **IV** 250 mg given over 5 min until dysrhythmias subside or 1 g is given, or 100 mg q15min until dysrhythmias subside or 1 g is given
**Child:** PO 3-8 mg/kg or 250 mg/m$^2$/day as single dose or divided in 2 doses; **IV** 3-8 mg/kg given over several min, or 250 mg/m$^2$/day as single dose or divided in 2 doses

### Renal dose

**Adult:** Do not use loading dose if CCr <10 ml/min or hepatic failure

**Available forms:** Susp 25 mg/5 ml; chew tabs 50 mg; inj 50 mg/ml; ext rel caps 100, 200, 300 mg; prompt rel caps 100 mg

### Implementation

**PO route**

- Do not interchange chewable product with caps, not equivalent; only ext rel caps are to be used for once-a-day dosing
- Give with meals to decrease GI upset
- Chew tab can be crushed or chewed; cap can be opened and mixed with foods or fluids; cap and tab are not interchangeable, only ext rel cap is to be used for once a day dosing
- Do not take antacids or antidiarrheals within 2-3 hr of taking phenytoin
- **Oral suspension:** shake well before each dose G tube/NG tube; dilute susp prior to administration; flush tube with 20 ml water after dose; hold tube feedings 1 hr before and 1 hr after dose
- Allow 7-10 days between dosage changes
- Divided PO doses with or after meals to decrease adverse effects
- 2 hr before or after antacid, enteral feeding
- Shake oral susp well; use measuring device for correct dose

**Direct IV route**

**BLACK BOX WARNING:** Give undiluted at ≤50 mg/min (adult) 1-3 mg/kg/min (neonates); 0.5-1 mg/kg/min

**Intermittent IV INF route**

**BLACK BOX WARNING:** Dilute dose in NS to ≤6.7 mg/ml, complete inf within 1 hr of preparation, use 0.22 or 0.55 micron in-line particulate final filter between **IV** catheter and tubing, flush the **IV** line or catheter with NS before and after use, give at ≤50 mg/min (adult), 0.5-1 mg/kg/min (child, infant, neonate)

## ADVERSE EFFECTS

**CNS:** Dizziness, insomnia, paresthesias, depression, suicidal tendencies, aggression, headache, confusion, slurred speech, peripheral neuropathy
**CV:** Hypotension, ventricular fibrillation, bradycardia, cardiac arrest
**EENT:** Nystagmus, diplopia, blurred vision
**ENDO:** Diabetes insipidus
**GI:** Nausea, vomiting, constipation, anorexia, weight loss, hepatitis, jaundice, gingival hyperplasia, abdominal pain
**GU:** Nephritis, urine discoloration, sexual dysfunction
**HEMA:** Agranulocytosis, leukopenia, aplastic anemia, thrombocytopenia, megaloblastic anemia
**INTEG:** Rash, lupus erythematosus, Stevens-Johnson syndrome, hirsutism, toxic epidermal necrolysis
**SYST:** Hypocalcemia, purple glove syndrome (IV), exacerbation of myasthenia gravis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Slowly absorbed from GI tract; erratic (IM) |
| **Distribution** | Crosses placenta, 90%-95% protein binding |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys, minimally; enters breast milk |
| **Half-life** | 7-42 hr, dose dependent |

### Pharmacodynamics

| | PO | PO-EXT REL | IM | IV |
|---|---|---|---|---|
| **Onset** | 2-24 hr | 2-24 hr | Erratic | 1-2 hr |
| **Peak** | 1½-3 hr | 4-12 hr | Erratic | Unknown |
| **Duration** | 6-12 hr | 12-36 hr | 12-24 hr | 12-24 hr |

## INTERACTIONS

### Individual drugs

Alcohol (chronic use), calcium (high dose), carBAMazepine, folic acid, rifampin: decreased effects of phenytoin

Chloramphenicol, cimetidine, cycloSERINE, disulfiram, alcohol, amiodarone, FLUoxetine, gabapentin, methylphenidate, felbamate, traZODone, diazepam, valproate: increased phenytoin effect

Delavirdine: decreased response, resistance, do not use together

### Drug classifications

Antacids, barbiturates: decreased effect of phenytoin

Antidepressants (tricyclics), benzodiazepines, sulfonamides, $H_2$ antagonists, azole antifungals, estrogens, succinimides, phenothiazines, salicylates: increased phenytoin level

### Drug/food

Enteral tube feeding: may decrease absorption of oral product, do not use enteral feedings 2 hr before and after dose

### Drug/lab test

Increased: glucose, alkaline phosphatase, BSP

Decreased: dexamethasone, metyrapone test serum, urinary steroids

## NURSING CONSIDERATIONS

### Assessment

- Assess product level: toxic level 30-50 mcg/ml; therapeutic level 7.5-20 mcg/ml, wait ≥1 wk to determine level
- **Assess mental status:** mood, sensorium, affect, memory (long, short), especially geriatric; suicidal thoughts/behaviors
- **Phenytoin hypersensitivity syndrome:** assess 3-12 wk after start of treatment: rash, temp, lymphadenopathy; may cause hepatotoxicity, renal failure, rhabdomyolysis
- **Serious skin disorders:** assess for beginning rash that may lead to Stevens-Johnson syndrome or toxic epidermal necrolysis; phenytoin should not be used again, may occur more often in Asian patients with HLA-B 1502
- **Purple glove syndrome:** with IV use
- **Phenytoin level:** toxic level 30-50 mcg/ml, therapeutic level: 7.5-20 mcg/ml, wait ≥1 wk to draw levels
- **Seizures:** assess for duration, type, intensity precipitating factors, obtain EEG periodically, monitor therapeutic level
- Blood studies: CBC, platelets q2wk until stabilized, then qmo × 12, then q3mo; discontinue product if neutrophils $<1600/m^3$; renal function: albumin conc; folic acid levels, LFTs
- **Blood dyscrasias:** assess fever, sore throat, bruising, rash, jaundice, epistaxis (long-term treatment only)
- Assess renal studies: urinalysis, BUN, urine creatinine
- Monitor blood studies: RBC, Hct, Hgb, reticulocyte counts weekly for 4 wk then monthly; also check thyroid function tests, serum calcium
- Monitor ECG, B/P, respiratory function during IV loading dose; verify potency of IV access port prior to IV infusion
- Monitor EEG function and serum levels periodically
- Monitor liver function tests for renal failure: ALT, AST, bilirubin, creatinine
- Assess for signs of physical withdrawal if medication suddenly discontinued
- Assess eye problems: need for ophth exam before, during, after treatment (slit lamp, funduscopy, tonometry)
- **Monitor for toxicity:** bone marrow depression, nausea, vomiting, ataxia, diplopia, CV collapse, slurred speech, confusion
- **Beers:** Avoid use in older adults unless safer alternatives are not available, ataxia, impaired psychomotor function may occur
- **Pregnancy/breastfeeding:** Pregnant patient should enroll in the Antiepileptic Drug Pregnancy Registry 888-233-2334, may cause fetal malformations, use other options when possible, breastfeeding is not recommended

### Patient/family education

- Teach patient to carry/wear emergency ID stating name, products taken, condition, prescriber's name and phone number
- Advise patient to avoid driving and other activities that require alertness until product response is known; dizziness, drowsiness can occur
- Advise patient to avoid alcohol ingestion and CNS depressants unless approved by prescriber; increased sedation may occur
- Teach patient not to discontinue medication quickly after long-term use; taper off over several wk
- Advise patient that urine may turn pink, red, or brown
- Caution patient to avoid antacids or antidiarrheals within 2-3 hr of taking phenytoin
- Instruct patient in proper oral hygiene to prevent gingival hyperplasia; to visit dentist routinely
- Teach patient to use nonhormonal contraception, to notify prescriber if pregnancy is planned or suspected

- Teach patient to notify prescriber of unusual bleeding, bruising, petechiae (bleeding), clay-colored stools, abdominal pain, dark urine, yellowing of skin/eyes (hepatotoxicity); slurred speech, headache, drowsiness
- Teach patient to report suicidal thoughts/behaviors immediately

### Evaluation

**Positive therapeutic outcome**
- Decreased seizure activity
- Decreased dysrhythmias
- Relief of pain

## physostigmine ophthalmic

*See Appendix B*

## phytonadione (vit $K_1$) (Rx)

(fye-toe-na-dye′one)
**Konakion ✱ Mephyton**
*Func. class.:* Vitamin $K_1$, fat-soluble vitamin

**Do not confuse:** Mephyton/methadone

**ACTION:** Needed for adequate blood clotting (factors II, VII, IX, X)

**Therapeutic outcome:** Prevention of bleeding

**USES:** Vitamin K malabsorption, hypoprothrombinemia, prevention of hypoprothrombinemia caused by oral anticoagulants, prevention of hemorrhagic disease of the newborn

### CONTRAINDICATIONS

Hypersensitivity, severe hepatic disease, last few wk of pregnancy

**Precautions:** Pregnancy, neonates, hepatic disease, IV use

**BLACK BOX WARNING:** Risk of anaphylaxis

### DOSAGE AND ROUTES

#### Hypoprothrombinemia caused by vitamin K malabsorption

**Adult:** PO/IM 2.5-25 mg; may repeat or increase to 50 mg
**Child:** PO 2.5-5 mg
**Infant:** PO/IM 2 mg

#### Prevention of hemorrhagic disease of the newborn

**Neonate:** IM 0.5-1 mg within 1 hr after birth; repeat in 2-3 wk if required

#### Hypoprothrombinemia caused by oral anticoagulants

**Adult and child:** PO/SUBCUT/IM 1-10 mg, may repeat 12-48 hr after PO dose or 6-8 hr after SUBCUT/IM dose, based on INR

**Available forms:** Tabs 5 mg; inj 10 mg/ml, 1 mg/0.5 ml

### Implementation

**IM route**
- Only use when other routes are not possible (deaths have occurred from allergic reactions)

**Intermittent IV infusion route**
- Give **IV** after diluting with $D_5$ NS 10 ml or more; give max 1 mg/min
- Give **IV** only when other routes not possible (deaths have occurred)
- Store in airtight, light-resistant container

**Y-site compatibilities:** Alfentanil, amikacin, aminophylline, ascorbic acid, atracurium, atropine, azaTHIOprine, aztreonam, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, ceFAZolin, cefonicid, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, ceftAZidime, ceftizoxime, ceftRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, clindamycin, cyanocobalamin, cycloSPORINE, dexamethasone, digoxin, diphenhydrAMINE, DOPamine, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epoetin alfa, erythromycin, esmolol, famotidine, fentaNYL, fluconazole, folic acid, furosemide, ganciclovir, gentamicin, glycopyrrolate, heparin, hydrocortisone, imipenem-cilastatin, indomethacin, insulin, isoproterenol, ketorolac, labetalol, lidocaine, mannitol, meperidine, metaraminol, methoxamine, methyldopate, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, morphine, multivitamins, nafcillin, nalbuphine, naloxone, nitroglycerin, nitroprusside, norepinephrine, ondansetron, oxacillin, oxytocin, papaverine, penicillin G potassium, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, potassium chloride, procainamide, prochlorperazine, propranolol, pyridoxine, ranitidine, sodium bicarbonate, succinylcholine, SUFentanil, theophylline, thiamine, ticarcillin/clavulanate, tobramycin, tolazoline, trimethaphan, urokinase, vancomycin, vasopressin, verapamil, vitamin B with C

**Y-site incompatibilities:** Dantrolene, diazepam, diazoxide, magnesium sulfate, phenytoin, trimethoprim/sulfamethoxazole

### ADVERSE EFFECTS

**CNS:** Headache, brain damage (large doses)
**GI:** Nausea, decreased liver function tests

**HEMA:** Hemolytic anemia, hemoglobinuria, hyperbilirubinemia
**INTEG:** Rash, urticaria
**RESP:** Bronchospasm, dyspnea, chest constriction, respiratory arrest

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO, IM, SUBCUT) |
| **Distribution** | Crosses placenta |
| **Metabolism** | Liver, rapidly |
| **Excretion** | Breast milk |
| **Half-life** | Unknown |

### Pharmacodynamics

| | PO | SUBCUT/IM |
|---|---|---|
| **Onset** | 6-12 hr | 1-2 hr |
| **Peak** | Unknown | 6 hr |
| **Duration** | Unknown | 14 hr |

## INTERACTIONS

### Individual drugs

Sucralfate, mineral oil: decreased action of phytonadione
Warfarin: decreased action of warfarin (large dose of this product)

### Drug classifications

Oral anticoagulants: decreased anticoagulant effect
Bile acid sequestrants, antiinfectives, salicylates: decreased action of phytonadione

### Drug/food

Olestra: decreased vit K levels

## NURSING CONSIDERATIONS

### Assessment

- Monitor pro-time during treatment (2-sec deviation from control time, bleeding time, and clotting time), INR
- Monitor for bleeding, INR pulse, and B/P
- Assess nutritional status: liver (beef), spinach, tomatoes, coffee, asparagus, broccoli, cabbage, lettuce, greens
- Assess for bleeding or bruising: hematuria, black tarry stools, hematemesis
- **Pregnancy/breastfeeding:** Usually not needed in pregnancy, may breastfeed

### Patient/family education

- Teach patient not to take other supplements unless directed by prescriber; to take this medication as directed
- Teach patient necessary foods high in vit K to be included in diet
- Advise patient to avoid IM inj, hard toothbrush, flossing; use electric razor until treatment is terminated
- Instruct patient to report symptoms of bleeding: bruising, nosebleeds, blood in urine, heavy menstruation, black tarry stools
- Caution patient not to use OTC medications unless approved by prescriber
- Stress the need for periodic lab tests to monitor coagulation levels
- Stress the need for patient to carry/wear emergency ID with condition, treatment, and medications taken

### Evaluation

**Positive therapeutic outcome**

- Decreased bleeding tendencies
- Decreased pro-time
- Decreased clotting time

## pilocarpine ophthalmic

*See Appendix B*

## pimavanserin

(pam-a-vans'er-in)
**Nuplazid**
*Func. class.:* Atypical antipsychotic

**ACTION:** The exact mechanism of action is unknown; may be mediated through inverse agonist and antagonist activity at serotonin 5-HT2A receptors, and to a lesser extent at 5-HT2C receptors

**Therapeutic outcome:** Decrease in hallucinations, delusions, paranoia; reorganization of patterns of thought and speech

**USES:** The treatment of hallucinations and delusions associated with Parkinson's disease psychosis

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Alcoholism, bradycardia, breastfeeding, cardiac arrhythmias, cardiac disease, children, coronary artery disease, diabetes mellitus, females, geriatric patients, heart failure, hepatic disease, hypertension, hypocalcemia, hypokalemia, hypomagnesemia, long QT syndrome, malnutrition, myocardial infarction, pregnancy, QT prolongation, renal failure, renal impairment, stroke, thyroid disease

**BLACK BOX WARNING:** Dementia-related psychosis

## DOSAGE AND ROUTES

**Adult: PO** 34 mg (taken as two 17-mg tablets) qday, without titration

**Hepatic dose**
**Adult:** PO Not recommended

### Renal dose
**Adult:** PO CCr 30 ml/min or more: No dosage adjustment needed; CCr <30 ml/min: Not recommended

### Other dosage adjustments
- **Patients receiving a strong CYP3A4 inhibitor:** 17 mg qday
- **Patients receiving a strong CYP3A4 inducer:** Monitor for reduced effect, increase dose if needed

**Available forms:** Tab 17 mg

### Implementation:
- Give without regard to food

## ADVERSE EFFECTS
**CNS:** Confusion, hallucinations, fatigue, stroke, dizziness

**GI:** Nausea, constipation

**Misc:** Peripheral edema, infection, QT prolongation

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding |
| **Metabolism** | Hepatic metabolism occurs through CYP3A4 and CYP3A5, and to a lesser extent CYP2J2, CYP2D6 with a major active metabolite |
| **Excretion** | 0.55% eliminated unchanged in the urine and 1.53% was eliminated in feces after 10 days |
| **Half-life** | Plasma half-lives of drug and metabolite are 57 hr and 200 hr, respectively |

### Pharmacodynamics

| | |
|---|---|
| Onset | Unknown |
| Peak | 6 hr |
| Duration | Unknown |

## INTERACTIONS
### Drug classifications
CYP2D6 inhibitors (fluoxetine, paroxetine, quinidine), CYP3A4 inhibitors (erythromycin, ketoconazole); reduce dose of pimavanserin: increased effects of pimavanserin

Other CNS depressants: increased sedation

Products that cause QT prolongation: Increase: QT prolongation, CYP3A4 inducers (carbamazepine): decreased pimavanserin effects

### Drug/herb
St. John's wort: decreased pimavanserin effect

## NURSING CONSIDERATIONS
### Assessment
**BLACK BOX WARNING:** Dementia-related psychosis: At increased risk of death, avoid using

- Swallowing of medication, check for hoarding, giving product to other patients
- AIMS assessment, neurologic function, LFTs, serum electrolytes, creatinine monthly
- Constipation daily, if this occurs, increase bulk, water in diet, stool softeners, laxatives may be needed
- **QT prolongation:** Avoid in those with cardiac disease or other risk factors for QT prolongation, torsades de pointes (TdP), and/or sudden death such as cardiac arrhythmias, congenital long QT syndrome, heart failure, bradycardia, myocardial infarction, hypertension, coronary artery disease, hypomagnesemia, hypokalemia, hypocalcemia, or in patients receiving medications known to prolong the QT interval. Females, elderly patients, patients with diabetes mellitus, thyroid disease, malnutrition, alcoholism, or hepatic impairment may also be at increased risk for QT prolongation
- **Renal disease:** Product is not recommended for patients with severe renal impairment (CCr <30 ml/min)
- **Hepatic disease:** Product is extensively metabolized in the liver, use is not recommended in patients with mild, moderate, or severe hepatic disease
- Stroke: Avoid antipsychotics to treat delirium or dementia-related behavioral problems unless nonpharmacologic options have failed or are not possible and the patient is a substantial threat to self or others, avoid use in those with a history of falls or fractures
- Hyponatremia: Product can cause hyponatremia and SIADH, and the elderly are at increased risk of developing these conditions, sodium levels should be closely monitored when starting or changing dosages of antipsychotics in older adults

## PATIENT/FAMILY EDUCATION
- To avoid hazardous activities until response is known, dizziness may occur
- That compliance with dose is needed
- To avoid OTC products unless approved by prescriber

**Evaluation:** Decrease in hallucinations, delusions, paranoia; reorganization of patterns of thought and speech

## pimecrolimus topical

*See Appendix B*

**⚠ HIGH ALERT**

## pioglitazone (Rx)

(pie-oh-glye'ta-zone)

**Actos**

*Func. class.:* Antidiabetic, oral

*Chem. class.:* Thiazolidinedione

**Do not confuse:** Actos/Actonel

**ACTION:** Specifically targets insulin resistance, an insulin sensitizer; regulates the transcription of a number of insulin-responsive genes

**Therapeutic outcome:** Decreased symptoms of diabetes mellitus

**USES:** Type 2 diabetes mellitus

## CONTRAINDICATIONS

Breastfeeding, children, hypersensitivity to thiazolidinediones, diabetic ketoacidosis

**BLACK BOX WARNING:** NYHA Class III/IV heart failure

**Precautions:** Pregnancy, thyroid/renal/hepatic disease, edema, geriatric patients with CV disease, polycystic ovary syndrome, bladder cancer, osteoporosis, pulmonary disease, secondary malignancy

## DOSAGE AND ROUTES

### Monotherapy

**Adult:** PO 15-30 mg/day, may increase to 45 mg/day; with strong CYP2C8 max 15 mg/day; those with NYHA class I/II heart failure max 15 mg/day

### Combination therapy

**Adult:** PO 15-30 mg/day with a sulfonylurea, metformin, or insulin; decrease sulfonylurea dose if hypoglycemia occurs; decrease insulin dose by 10%-25% if hypoglycemia occurs or if plasma glucose is <100 mg/dl; max 45 mg/day

### Hepatic dose

Do not use in active liver disease or if ALT >2.5 × ULN

**Available forms:** Tabs 15, 30, 45 mg

### Implementation

- Convert from other oral hypoglycemic agents; change may be made with gradual dosage change; monitor serum glucose during conversion
- Give once a day without regard to meals
- Give tabs crushed and mixed with meal or fluids for patients with difficulty swallowing
- Store in airtight container in cool environment

## ADVERSE EFFECTS

**CNS:** *Headache*

**CV:** MI, heart failure, death (geriatric patients)

**ENDO:** Hyper/hypoglycemia

**MISC:** *Myalgia, sinusitis, upper respiratory tract infection, pharyngitis,* hepatotoxicity, edema, weight gain, anemia, macular edema; risk of bladder cancer (use >1 yr), peripheral/pulmonary edema

**MS:** Fractures (females), rhabdomyolysis, myalgia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding >99% |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys |
| **Half-life** | 3-7 hr, terminal 16-24 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 6-12 wk |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Atorvastatin: decreased effect of this product

Fluconazole, itraconazole, ketoconazole, miconazole, voriconazole: decreased pioglitazone effect

### Drug classifications

CYP2C8 inducers: decreased pioglitazone effect

Oral contraceptives: decreased effect, use an alternative contraceptive method

### Drug/herb

Garlic, green tea, horse chestnut: increased hypoglycemia

### Drug/lab test

Increased: CPK, LFTs, HDL, cholesterol

Decreased: glucose, Hct/Hgb

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Heart failure:** do not use in NYHA Class III/IV; excessive/rapid weight gain > 5 lb, dyspnea, edema; may need to be reduced or discontinued, monitor daily weights

• **Hypoglycemic reactions:** assess for hypoglycemic reactions (sweating, weakness, dizziness, anxiety, tremors, hunger), hyperglycemic reactions soon after meals (rare)
• **Bladder cancer:** Avoid use in patients with history of bladder cancer; use of pioglitazone >1 yr has been correlated with an increase in bladder cancer; may occur more often with insulin or other antidiabetics
• **Hepatic disease:** check LFTs periodically: AST, LDH; do not start treatment in active heart disease or if ALT >2.5× upper limit of normal; if treatment has already begun, follow closely with continuing ALT levels; if ALT increases to >3× upper limit of normal, recheck ALT as soon as possible, if ALT remains >3× upper limit of normal, discontinue
• Monitor FBS, glycosylated HbA1c, plasma lipids/lipoproteins, B/P, body weight during treatment
• Monitor CBC with differential prior to and during therapy, more necessary in those with anemia, Hct/Hgb (may be decreased in first few months of treatment)
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, usually insulin is used in pregnancy, do not breastfeed, excretion unknown
• **Beers:** Avoid use in older adults, may promote fluid retention and/or exacerbate heart failure

### Patient/family education

• Teach patient to self-monitor using a blood glucose meter
• Teach patient symptoms of hypo/hyperglycemia, what to do about each (rare)
• Advise patient that product must be continued on daily basis; explain consequence of discontinuing product abruptly
• Advise patient to avoid OTC medications or herbal preparations unless approved by prescriber; to report weight gain, edema
• Advise patient that diabetes is lifelong illness; that this product is not a cure, only controls symptoms
• Instruct patient to notify prescriber if oral contraceptives are used, effect may be decreased
• Teach patient not to use if breastfeeding
• Teach patient that lab work, eye exams will be needed periodically

### Evaluation

**Positive therapeutic outcome**

• Decrease in polyuria, polydipsia, polyphagia; clear sensorium; absence of dizziness; stable gait; blood glucose, A1c improvement

## piperacillin/tazobactam (Rx)

(pip′er-ah-sill′in/ta-zoe-bak′tam)
**Tazocin, Zosyn**
*Func. class.:* Broad-spectrum antiinfective
*Chem. class.:* Extended-spectrum penicillin

**ACTION:** Interferes with cell wall replication of susceptible organisms; tazobactam is a β-lactamase inhibitor, protects piperacillin from enzymatic degradation

**Therapeutic outcome:** Bactericidal effects for piperacillin-resistant β-lactamase, *Escherichia coli, Staphylococcus aureus, Bacteroides fragilis, Bacteroides ovatus, Bacteroides thetaiotaomicron, Bacteroides vulgatus, Haemophilus influenzae*

**USES:** Moderate to severe infections: piperacillin-resistant, β-lactamase strains causing infections in respiratory tract, skin, skin structure, urinary tract, bone, and joint; gonorrhea, pneumonia, infections from penicillinase-producing staphylococci, streptococci

**Unlabeled uses:** Endocarditis

### CONTRAINDICATIONS

Hypersensitivity to penicillins; neonates, carbapenem allergy

**Precautions:** Pregnancy, breastfeeding, HF, seizures, hypersensitivity to cephalosporins, renal insufficiency in neonates, GI disease, electrolyte imbalances, biliary obstruction

### DOSAGE AND ROUTES

**Nosocomial pneumonia**

**Adult: IV** 4.5 g q6hr or 3.375 g q4hr with an aminoglycoside or antipseudomonal fluoroquinolone × 1-2 wk

**Appendicitis/peritonitis**

**Child ≥40 kg (88 lb): IV** 3.375 g q6hr × 7-10 days
**Child ≥9 mo and <40 g: IV** 100 mg (piperacillin)/q8hr × 7-10 days
**Infant 2 mo to <9 mo: IV** 80 mg/kg (piperacillin) q8hr × 7-10 days

**Renal dose**

**Adult:** IV CCr 20-40 ml/min give 3.375 g q6hr (nosocomial pneumonia); give 2.25 g q6hr (all other indications); CCr <20 ml/min, give 2.25 g q6hr (nosocomial pneumonia); give 2.25 g q8hr (all other indications)

**Available forms:** Powder for inj 2 g piperacillin/0.25 g tazobactam, 3 g piperacillin/0.375 g tazobactam, 4 g piperacillin/0.5 g tazobactam, 36 g piperacillin/4.5 g tazobactam

## Implementation

• Separate aminoglycoside from piperacillin to avoid inactivation
• Product after C&S is complete

**Intermittent IV infusion route**

• Reconstitute each 1 g of product/5 ml 0.9% NaCl for inj or sterile water for inj, dextrose 5%; shake well; further dilute in at least 50 ml compatible IV sol and run as int inf over at least 30 min

**ADD-Vantage IV solution: reconstitution**

• Reconstitute with 0.9% NaCl or $D_5W$ in the appropriate flexible diluent container provided; for 500 mg vials, use at least a 100 ml diluent container and for 750 mg and 1 g vials, use only the 250 ml diluent container
• Remove the protective covers from the top of the vial and vial port. Remove vial cap (do not access with a syringe) and vial port cover. Screw the vial into the vial port until it will go no further to assure a seal. Once vial is sealed to the port, do not remove. To activate the contents of the vial, squeeze the bottom of the diluent container gently to inflate the portion of the container surrounding the end of the drug vial. With the other hand, push the drug vial down into the container telescoping walls of the container and grasp the inner cap of the vial through the walls of the container. Pull the inner cap from the drug vial. Verify the rubber stopper has been pulled out, allowing the drug and diluent to mix. Mix the container contents thoroughly
• *Storage after reconstitution:* The admixture solution may be stored for up to 24 hr at room temperature. Do not refrigerate or freeze after reconstitution
• Do not use in series connections with flexible containers

**Pre-mixed Galaxy IV solution**

• Thaw frozen containers at room temperature (20-25° C or 68-77° F) or under refrigeration (2-8° C or 36-46° F). Do not force thaw by immersion in water baths or by microwaving. Check for leaks by squeezing bag firmly
• Do not admix
• Contents of the solution may precipitate in the frozen state and should dissolve with little or no agitation once the solution has reached room temperature
• *Storage:* The thawed solution is stable for 24 hours at room temperature or for 14 days under refrigeration. Do not refreeze thawed product
• Do not use plastic containers in series connections as this could result in an embolism due to residual air being drawn from the primary container before administration of the fluid from the secondary container is complete

**IV infusion**

• Infuse IV over at least 30 min. Ambulatory intravenous infusion pumps can be used; the solution is stable for up to 12 hr at room temperature

**Y-site compatibilities:** Alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amphotericin B lipid complex, amphotericin B liposome, anidulafungin, argatroban, atenolol, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, busulfan, butorphanol, calcium acetate/chloride/gluconate, CARBOplatin, carmustine, cefepime, chloramphenicol, cimetidine, clindamycin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexrazoxane, diazepam, digoxin, diphenhydrAMINE, DOCEtaxel, DOPamine, doxacurium, enalaprilat, ePHEDrine, EPINEPHrine, eptifibatide, erythromycin, esmolol, etoposide, fenoldopam, fentaNYL, floxuridine, fluconazole, fludarabine, fluorouracil, foscarnet, fosphenytoin, furosemide, gallium, granisetron, heparin, hydrocortisone, HYDROmorphone, ifosfamide, isoproterenol, ketorolac, lansoprazole, lepirudin, leucovorin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, mesna, metaraminol, methotrexate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, milrinone, morphine, naloxone, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, PEMEtrexed, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, plicamycin, potassium chloride/phosphates, procainamide, ranitidine, remifentanil, riTUXimab, sargramostim, sodium acetate/bicarbonate/phosphates, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, tacrolimus, telavancin, teniposide, theophylline, thiotepa, tigecycline, tirofiban, trimethobenzamide, vasopressin, vinBLAStine, vinCRIStine, voriconazole, zidovudine, zoledronic acid

**Y-site incompatibilities:** Fluconazole, ondansetron, sargramostim, vinorelbine

## ADVERSE EFFECTS

**CNS:** Headache, insomnia, dizziness, fever, lethargy, hallucinations, anxiety, depression, twitching, seizures, vertigo
**CV:** Cardiac toxicity, edema
**GI:** *Nausea, vomiting, diarrhea,* increased AST, ALT, abdominal pain, glossitis, constipation, pseudomembranous colitis, pancreatitis
**GU:** Oliguria, proteinuria, hematuria, *vaginitis, moniliasis,* glomerulonephritis, renal failure

**HEMA:** Anemia, increased bleeding time, bone marrow depression, agranulocytosis, hemolytic anemia
**INTEG:** Rash, pruritus, exfoliative dermatitis
**META:** Hypokalemia, hypernatremia
**SYST:** Serum sickness, anaphylaxis, Stevens-Johnson syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (80%) |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys, unchanged (90%); bile (10%); breast milk |
| **Half-life** | 0.7-1.3 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | Inf end |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Aspirin, probenecid: increased piperacillin levels
Methotrexate: increased effect of methotrexate

### Drug classifications

Aminoglycosides (**IV**): decreased piperacillin effect
Anticoagulants (oral): increased effect of anticoagulants
Contraceptives (oral): decreased contraceptive effectiveness
Neuromuscular blockers: increased effects
Tetracyclines: decreased antimicrobial effectiveness of piperacillin

### Drug/lab test

Increased: eosinophilia, neutropenia, leucopenia, serum creatinine, PTT, AST, ALT, alkaline phosphatase, bilirubin, BUN, electrolytes
Decreased: Hct, Hgb, electrolytes
False positive: urine glucose, urine protein, Coombs' test

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for previous sensitivity reaction to penicillins or other cephalosporins; cross-sensitivity between penicillins and cephalosporins is common
- Assess patient for signs and symptoms of infection, including characteristics of wounds, sputum, urine, stool, WBC >10,000/mm$^3$, fever; obtain information baseline, during treatment
- Obtain C&S before beginning product therapy to identify if correct treatment has been initiated
- **Assess for allergic reactions:** rash, urticaria, pruritus, chills, fever, joint pain; angioedema may occur a few days after therapy begins; EPINEPHrine, resuscitation equipment should be available for anaphylactic reaction
- Identify urine output; if decreasing, notify prescriber (may indicate nephrotoxicity); also check for increased BUN, creatinine
- Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test monthly if patient is on long-term therapy
- Monitor electrolytes: potassium, sodium, chloride monthly if patient is on long-term therapy
- **Pseudomembranous colitis:** assess for diarrhea, abdominal pain, fever, fatigue, anorexia; possible anemia, elevated WBC and low serum albumin; stop product and usually give either vancomycin or IV metroNIDAZOLE
- Monitor for bleeding: ecchymosis, bleeding gums, hematuria, stool guaiac daily if on long-term therapy
- **Assess for overgrowth of infection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum
- **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding

### Patient/family education

- Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
- Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate **superinfection**
- Advise patient to notify prescriber of diarrhea with blood or pus, which may indicate pseudomembranous colitis

### Evaluation

**Positive therapeutic outcome**

- Absence of signs/symptoms of infection (WBC <10,000/mm$^3$, temp WNL, absence of red, draining wounds)
- Reported improvement in symptoms of infection

**TREATMENT OF ANAPHYLAXIS:** Withdraw product, maintain airway, administer EPINEPHrine, aminophylline, $O_2$, **IV** corticosteroids

P

## RARELY USED

## pirfenidone

(pir-fen'i-done)
**Esbriet**
*Func. class.:* Respiratory agent

**USES:** Pulmonary fibrosis

**CONTRAINDICATIONS:** Hypersensitivity

## DOSAGE AND ROUTES

**Adult: PO** Titrate over 2 wk to a maintenance dose of 801 mg tid. Give 267 mg tid on days 1-7, 534 mg tid on days 8-14, and 801 mg tid from day 15 onward

**Available forms:** Cap 267 mg

## pitavastatin (Rx)

(pit'a-va-stat'in)
**Livalo**
*Func. class.:* Antilipidemic
*Chem. class.:* HMG-CoA reductase inhibitor

**Do not confuse:** pitavastatin/pravastatin

**ACTION:** Inhibits HMG-CoA reductase enzyme, which reduces cholesterol synthesis, high doses lead to plaque regression

**Therapeutic outcome:** Decreased cholesterol levels and LDLs, increased HDLs

**USES:** As an adjunct in primary hypercholesterolemia (types Ia, Ib), dysbetalipoproteinemia, elevated triglyceride levels; prevention of cardiovascular disease by reduction of heart risk in those with mildly elevated cholesterol

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity, active liver disease, cholestasis

**Precautions:** Past liver disease, alcoholism, severe acute infections, trauma, severe metabolic disorders, electrolyte imbalance, seizures, surgery, organ transplant, endocrine disease, females, hypotension, renal disease

## DOSAGE AND ROUTES

**Adult:** PO 2 mg/day, usual range 1-4, max 4 mg/day

### Renal dose

**Adult:** PO CCr 30-60 ml/min 1 mg qd, max 2 mg qd; CCr <30 ml/min on hemodialysis 1 mg qd, max 2 mg qd; CCr <30 ml/min not on hemodialysis—not recommended

**Available forms:** Tabs 1, 2, 4 mg

### Implementation

- Administer total daily dose at any time of day
- Store in cool environment in tight container protected from light

## ADVERSE EFFECTS

**CNS:** Headache
**GI:** Constipation, diarrhea
**INTEG:** Rash, pruritus, alopecia
**MS:** Myalgia, rhabdomyolysis, arthralgia
**RESP:** Pharyngitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Concentrations are lower in healthy African Americans |
| **Metabolism** | Liver |
| **Excretion** | Urine, feces |
| **Half-life** | 12 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Clofibrate, cycloSPORINE, erythromycin, gemfibrozil, niacin: increased risk of rhabdomyolysis
Colestipol: decreased action of atorvastatin
Erythromycin: increased levels of atorvastatin

### Drug classifications

Antifungals (azole): possible rhabdomyolysis

### Drug/herb

Red yeast rice: increased pitavastatin effect

### Drug/lab test

Increased: bilirubin, alkaline phosphatase, ALT, AST
Interference: thyroid function tests

## NURSING CONSIDERATIONS

### Assessment

- Assess nutrition: fat, protein, carbohydrates; nutritional analysis should be completed by dietitian before treatment
- **Rhabdomyolysis:** assess for muscle pain, tenderness; obtain CPK if these occur; product may need to be discontinued
- Monitor bowel pattern daily; diarrhea may be a problem
- Monitor triglycerides, cholesterol at baseline, throughout treatment; LDL and VLDL should be watched closely; if increased, product should be discontinued
- Monitor liver function studies q1-2mo during the first 1½ yr of treatment; AST, ALT, liver function tests may be increased
- Monitor renal studies in patients with compromised renal system: BUN, I&O ratio, creatinine

• Assess eyes via ophthalmic exam 1 mo after treatment begins, annually
• **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

• Inform patient that compliance is needed for positive results to occur, not to double doses
• Teach patient that risk factors should be decreased: high-fat diet, smoking, alcohol consumption, absence of exercise
• Advise patient to notify prescriber if the GI symptoms of diarrhea, abdominal or epigastric pain, nausea, vomiting; chills, fever, sore throat; muscle pain, weakness occur
• Advise patient that treatment will take several years
• Advise patient that blood work will be necessary during treatment
• Teach patient that product may increase blood glucose level
• Advise patient not to take if pregnant, pregnancy, avoid breastfeeding

### Evaluation

**Positive therapeutic outcome**
• Decreased cholesterol levels, serum triglyceride
• Improved ratio of HDLs

## posaconazole (Rx)

(poe'sa-kon'a-zole)
**Noxafil, Posanol**
*Func. class.:* Antifungal, systemic
*Chem. class.:* Triazole derivative

**ACTION:** Inhibits a portion of cell wall synthesis; alters cell membranes and inhibits several fungal enzymes

**Therapeutic outcome:** Decreased fever, malaise, rash; negative C&S for infecting organism

**USES:** Prevention of aspergillus, candida infection, oropharyngeal candidiasis in the immunocompromised, chemotherapy-induced neutropenia, mucocutaneous candidiasis

## CONTRAINDICATIONS

Hypersensitivity to this product or other systemic antifungal or azoles, fungal meningitis, onchomycosis or dermatomycosis in cardiac dysfunction, use with ergots, sirolimus, CYP3A4 substrates

**Precautions:** Pregnancy, breastfeeding, children, hepatic/cardiac/renal disease

## DOSAGE AND ROUTES

**Adult/adolescent:** PO 600 mg/day in 2-4 divided doses

### Oropharyngeal candidiasis

**Adult:** PO 100 mg bid × 1 day, then 100 mg/day × 13 days

### Oropharyngeal candidiasis resistant to fluconazole or itraconazole

**Adult/Child ≥13 yr:** PO 400 mg bid

**Available forms:** Oral susp 200 mg/5 ml; delayed release tab 100 mg; solution for injection 300 mg/16.7 ml

### Implementation

**PO route**
• **Oral susp:** give after shaking well; use calibrated measuring device; take only with a full meal or liquid nutritional supplements such as Ensure; rinse measuring device after each use
• Store in a tight container in refrigerator; do not freeze
• **Delayed-release tab:** Do not divide, chew, or crush; give with food

**IV route**
**Intermittent IV infusion:**
• Use 0.22 micron PES or PVDF filter, give slowly over 90 min through central line, if central line is not available may give a single dose through a peripheral line over 30 min, do not give multiple doses by this method

**Dilution:**
• Bring to room temperature, transfer 16.7 ml of posaconazole to IV solution that is sufficient for final concentration of 1-2 mg/ml, use immediately (diluted solution)
• Store up to 2 hr refrigerated

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness,* insomnia, fever, rigors, weakness, anxiety
**CV:** Hypo/hypertension, tachycardia, anemia, QT prolongation, torsades de pointes
**GI:** *Nausea, vomiting, anorexia, diarrhea,* cramps, abdominal pain, flatulence, GI bleeding, hepatotoxicity
**GU:** Gynecomastia, impotence, decreased libido
**INTEG:** *Pruritus,* fever, *rash,* toxic epidermal necrolysis
**MISC:** *Edema, fatigue,* malaise, hypokalemia, tinnitus, rhabdomyolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed, enhanced by food |
| **Distribution** | Protein binding 98%-99% |
| **Metabolism** | Liver |
| **Excretion** | Feces, 77% unchanged |
| **Half-life** | 19-35 hr |

P

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 3-5 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Atorvastatin, lovastatin: do not use concurrently

BusPIRone, busulfan, clarithromycin, cycloSPORINE, diazepam, digoxin, felodipine, indinavir, isradipine, midazolam, niCARdipine, NIFEdipine, niMODipine, phenytoin, quiNIDine, ritonavir, saquinavir, tacrolimus, warfarin: increased levels, toxicity

Haloperidol, chloroquine, droperidol, pentamidine; arsenic trioxide, levomethadyl: increased QT prolongation

Cimetidine, phenytoin: decreased posaconazole level

Didanosine, rifamycin: decreased posaconazole action

Dofetilide, pimozide, quiNIDine, halofantrine: life-threatening reactions, increased QT prolongation

Midazolam (oral), triazolam: increased sedation

QuiNIDine: increased tinnitus, hearing loss

### Drug classifications

Antacids, $H_2$-receptor antagonists, rifamycins: decreased posaconazole action

Class IA/III antidysrhythmics, some phenothiazines, beta agonists, local anesthetics, tricyclics, CYP3A4 inhibitors (amiodarone, clarithromycin, erythromycin, telithromycin, troleandomycin), CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone): increased QT prolongation

Ergots: life-threatening reactions, increased QT prolongation

Other hepatotoxic products: increased hepatotoxicity

Calcium channel blockers, HMG-CoA reductase inhibitors, vinca alkaloids: increased levels, toxicity

Oral hypoglycemics: increased severe hypoglycemia

### Drug/food

Food: increased absorption

## NURSING CONSIDERATIONS

### Assessment

- **Rhabdomyolysis:** assess for muscle pain, increased CPK, weakness, swelling of affected muscles; if these occur and if confirmed by CPK, product should be discontinued
- **QT prolongation:** monitor ECG for QT prolongation, ejection fraction; assess for chest pain, palpitations, dyspnea
- Assess for type of infection; may begin treatment before obtaining results
- Assess for infection: temp, WBC, sputum, baseline, periodically, breakthrough infections may occur when used with fosamprenavir
- Monitor I&O ratio, potassium levels
- Monitor liver function tests (ALT, AST, bilirubin) if on long-term therapy
- Assess for allergic reaction: rash, photosensitivity, urticaria, dermatitis
- **Assess for hepatotoxicity:** nausea, vomiting, jaundice, clay-colored stools, fatigue
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, may cause malformations, breastfeeding isn't recommended

### Patient/family education

- Teach patient that long-term therapy may be needed to clear infection (1 wk-6 mo depending on infection)
- Advise patient to avoid hazardous activities if dizziness occurs
- Advise patient to take 2 hr before administration of other products that increase gastric pH (antacids, $H_2$-blockers, omeprazole, sucralfate, anticholinergics); to notify health care provider of all medications taken (many interactions)
- Teach the patient the importance of compliance with product regimen; to use alternative method of contraception
- Teach patient to notify prescriber of GI symptoms, signs of hepatic dysfunction (fatigue, nausea, anorexia, vomiting, dark urine, pale stools)
- Teach patient to take during meal or within 20 min of eating

### Evaluation

**Positive therapeutic outcome**

- Decreased fever, malaise, rash, negative C&S for infecting organism

**potassium acetate/potassium bicarbonate (Rx, OTC)**
**K-Effervescent, Klor-Con EF, K-Vescent**
**potassium bicarbonate potassium chloride (Rx, OTC)**
**Neo-K**

## potassium bicarbonate/ potassium citrate (Rx, OTC)

**⚠ HIGH ALERT**

## potassium chloride (Rx, OTC)

**Epiklor, Klor-Con, K-Tab, Micro-K, Odan K-20** 🍁

## potassium gluconate (Rx, OTC)

**Kaon, Kaylixir, K-G Elixir, Potassium-Rougier** 🍁

*Func. class.:* Electrolyte, mineral replacement

*Chem. class.:* Potassium

**ACTION:** Needed for adequate transmission of nerve impulses and cardiac contraction, renal function, intracellular ion maintenance

**Therapeutic outcome:** Potassium level 3.0-5.0 mg/dl

**USES:** Prevention and treatment of hypokalemia

## CONTRAINDICATIONS

Renal disease (severe), severe hemolytic disease, Addison's disease, hyperkalemia, acute dehydration, extensive tissue breakdown

**Precautions:** Pregnancy, cardiac disease, potassium-sparing diuretic therapy, systemic acidosis

## DOSAGE AND ROUTES

### Hypokalemia (prevention) (bicarbonate, chloride, gluconate)

**Adult:** **PO** 20 mEq/day in 1-2 divided doses

**Child:** **PO** 1-2 mEq/day in 1-2 divided doses

### Hypokalemia, digoxin toxicity (acetate, chloride)

**Adult:** serum potassium conc > 2.5 mEq/L: **IV** max 10 mEq/l hr, with 24 hr dose max 200 mEq, initial dose of 20-40 mEq has been recommended; **PO** 40-100 mEq/day in 2-4 divided doses

**Child:** **IV** 0.25-0.5 mEq/g/dose, at 0.25-0.5 mEq/kg/hr; **PO** 2-5 mEq/day in divided doses

**Available forms:** Tabs for sol 6.5, 25 mEq; ext rel caps 8, 10 mEq; powder for sol 3.3, 5, 6.7, 10, 13.3 mEq/5 ml; tabs 2, 4, 5, 13.4 mEq; ext rel tabs 6.7, 8, 10 mEq; elix 6.7 mEq/5 ml; oral sol 2.375 mEq/5 ml; inj for prep of IV 1.5, 2, 2.4, 3, 3.2, 4.4, 4.7 mEq/ml

### Implementation

**PO route**

- Do not break, crush, or chew ext rel tabs/caps or enteric-coated products
- Give with meal or after meal; take cap with full glass of liquid; dissolve effervescent tab, powder in 8 oz of cold water or juice; do not give IM, SUBCUT
- Store at room temperature

**IV route**

- Give through large-bore needle to decrease vein inflammation; check for extravasation; administer in large vein, avoiding scalp vein in child
- After diluting in large volume of **IV** sol give as an **IV** inf slowly to prevent toxicity; never give **IV** bol or IM

**>> Potassium acetate**

**Additive compatibilities:** Metoclopramide

- **Potassium chloride** must be diluted, concentrated potassium injections are fatal

**Continuous IV infusion route**

- Conc max 80 mEq/L for peripheral line, 120 mEq/L central line
- Dehydrated patients should receive 1 L of potassium-free hydration sol; then infuse 10 mEq/hr; in severe hypokalemia rate may be 40 mEq/hr

**Y-site compatibilities:** Acyclovir, aldesleukin, allopurinol, amifostine, aminophylline, amiodarone, ampicillin, atropine, aztreonam, betamethasone, calcium gluconate, cefmetazole, cephalothin, cephapirin, chlordiazePOXIDE, chlorproMAZINE, ciprofloxacin, cladribine, cyanocobalamin, dexamethasone, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOPAmine, droperidol, edrophonium, enalaprilat, EPINEPHrine, esmolol, estrogens, ethacrynate, famotidine, fentaNYL, filgrastim, fludarabine, fluorouracil, furosemide, gallium, granisetron, heparin, hydrALAZINE, IDArubicin, indomethacin, inamrinone, regular insulin, isoproterenol, kanamycin, labetalol, lidocaine, LORazepam, magnesium sulfate, melphalan, meperidine, methicillin, methoxamine, methylergonovine, midazolam, minocycline, morphine, neostigmine, norepinephrine, ondansetron, oxacillin, oxytocin, PACLitaxel, penicillin G potassium, pentazocine, phytonadione, piperacillin/tazobactam, prednisoLONE, procainamide, prochlorperazine, propofol, propranolol, pyridostigmine, sargramostim, scopolamine, sodium bicarbonate, succinylcholine, tacrolimus, teniposide, theophylline, thiotepa, trimethaphan, trimethobenzamide, vinorelbine, zidovudine

### >> Potassium chloride

**Y-site compatibilities:** Aldesleukin, amifostine, granisetron, LORazepam, midazolam, thiotepa

## ADVERSE EFFECTS

**CNS:** Confusion
**CV:** Bradycardia, *cardiac depression,* dysrhythmias, arrest, peaking T waves, lowered R and depressed RST, prolonged P–R interval, widened QRS complex
**GI:** *Nausea, vomiting, cramps,* pain, *diarrhea,* ulceration of small bowel
**GU:** Oliguria
**INTEG:** Cold extremities, rash

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys, feces |
| **Half-life** | Unknown |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | 30 min | Immediate |
| **Peak** | Unknown | Unknown |
| **Duration** | Unknown | Unknown |

## INTERACTIONS

### Drug classifications

Angiotensin-converting enzyme inhibitors, calcium, diuretics (potassium-sparing), magnesium, potassium phosphate, **IV,** other potassium products: increased hyperkalemia

## NURSING CONSIDERATIONS

### Assessment

- Assess ECG for peaking T-waves, lowered R, depressed RST, prolonged PR interval, widening QRS complex, hyperkalemia; product should be reduced or discontinued
- Monitor potassium level during treatment (3.5-5.0 mg/dl is normal level)
- Monitor hydration status, I&O ratio; watch for decreased urinary output; notify prescriber immediately; check urinary pH in patients receiving the product as a urinary acidifier
- Assess cardiac status: rate, rhythm, CVP, PWP, PAWP if being monitored directly
- **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding

### Patient/family education

- Teach patient to eat foods rich in potassium after medication is discontinued
- Advise patient to avoid OTC products: antacids, salt substitutes, analgesics, vit preparations, unless specifically directed by prescriber; avoid licorice in large amounts, may cause hypokalemia, sodium retention
- Advise patient to report hyperkalemia symptoms or continued hypokalemia symptoms
- Tell patient to take cap with full glass of liquid; to dissolve powder or tab completely in at least 120 ml of water or juice; not to crush, chew caps or tabs
- Emphasize importance of regular follow-up and periodic potassium levels

### Evaluation

**Positive therapeutic outcome**

- Absence of fatigue, muscle weakness, and decreased thirst and urinary output, cardiac changes
- Potassium level normal

## pramipexole (Rx)

(pra-mi-pex′ol)
**Mirapex, Mirapex ER**
*Func. class.:* Antiparkinsonian agent
*Chem. class.:* Dopamine receptor agonist, nonergot

**ACTION:** Selective agonist for $D_2$ receptors (presynaptic/postsynaptic sites); binding at $D_3$ receptor contributes to antiparkinson effects

**Therapeutic outcome:** Decreased symptoms of Parkinson's disease (involuntary movements)

**USES:** Idiopathic Parkinson's disease, restless leg syndrome

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy renal/cardiac disease, MI with dysrhythmias, affective disorders, psychosis, preexisting dyskinesias, history of falling asleep during daily activities, rapid dose reduction

## DOSAGE AND ROUTES

### Initial treatment

**Adult:** PO from a starting dose of 0.375 mg/day given in 3 divided doses, increase gradually by 0.125 mg/dose at 5-7–day intervals until total daily dose of 4.5 mg is reached; ER 0.375 mg qd, may increase up to 0.75 mg/day, then increments of 0.75 mg/day ≤5-7 days, max 4.5 mg/day

### Restless leg syndrome

**Adult:** PO 0.125 mg 2-3 hr before bedtime, increase gradually, max 0.5 mg/day

### Renal dose
**Adult:** PO CCr 35-59 ml/min 0.125 mg bid, may increase q5-7day to 1.5 mg bid; CCr 15-34 ml/min 0.125 mg/day, may increase q5-7day to 1.5 mg/day

**Available forms:** Tabs 0.125, 0.25, 0.5, 0.75, 1, 1.5 mg; cap ER 0.375, 0.75, 1.5, 2.25, 3.0, 3.75, 4.5 mg

### Implementation
- Adjust dosage to patient's response
- Give with meals to decrease GI upset

## ADVERSE EFFECTS
**CNS:** *Agitation, insomnia,* psychosis, hallucinations, depression, dizziness, headache, confusion, amnesia, dream disorder, asthenia, dyskinesia, hypersomnolence, sudden sleep onset, impulse-control disorders
**CV:** *Orthostatic hypotension,* edema, syncope, tachycardia, increased B/P, heart rate
**EENT:** Blurred vision
**ENDO:** Antidiuretic hormone secretion (SIADH)
**GI:** *Nausea, anorexia,* constipation, dysphagia, dry mouth
**GU:** Impotence, urinary frequency
**HEMA:** Hemolytic anemia, leukopenia, agranulocytosis
**INTEG:** Pruritus

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver, minimally |
| **Excretion** | Kidneys, unchanged |
| **Half-life** | 8 hr; 12 hr in geriatric |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2 hr |
| **Duration** | Unknown |

## INTERACTIONS
### Individual drugs
Cimetidine, diltiazem, levodopa, quiNIDine, ranitidine, triamterene, verapamil: increased pramipexole levels
Metoclopramide: decreased pramipexole levels

### Drug classifications
Butyrophenones, DOPamine agonists, phenothiazines: decreased pramipexole effect

## NURSING CONSIDERATIONS
### Assessment
- Monitor B/P, ECG, respiration during initial treatment; hypo/hypertension should be reported
- Assess mental status: affect, mood, behavioral changes, depression; complete suicide assessment
- Assess for involuntary movements in parkinsonism: akinesia, tremors, staggering gait, muscle rigidity, drooling; these symptoms should improve with therapy
- **Assess for sleep attacks:** may fall asleep during activities, without warning; may need to discontinue medication
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, may cause fetal harm, do not breastfeed

### Patient/family education
- Advise patient that therapeutic effects may take several wk to a few mo
- Caution patient to change positions slowly to prevent orthostatic hypotension
- Instruct patient to use product exactly as prescribed; if product is discontinued abruptly, parkinsonian crisis may occur; if treatment is to be discontinued, taper over 1 wk; avoid alcohol, OTC sleeping products
- Advise patient to notify prescriber if pregnancy is planned or suspected
- Teach patient to notify prescriber of impulse control disorders: shopping

### Evaluation
**Positive therapeutic outcome**
- Decreased akathisia, other involuntary movements
- Improved mood

**⚠ HIGH ALERT**

## pramlintide (Rx)
(pram′lin-tide)
**SymlinPen**
*Func. class.:* Antidiabetic
*Chem. class.:* Synthetic human amylin analog

**ACTION:** Modulates and slows stomach emptying, prevents postprandial rise in plasma glucagon, decreases appetite, leads to decreased caloric intake and weight loss

**Therapeutic outcome:** Decreased polyuria, polydipsia, polyphagia; improved A1C

**USES:** As an adjunct to insulin therapy with uncontrolled type 1 or type 2 diabetes mellitus

## CONTRAINDICATIONS
Hypersensitivity to this product or cresol, gastroparesis

**BLACK BOX WARNING:** Hypoglycemia

**Precautions:** Pregnancy, breastfeeding, osteoporosis, thyroid disease, trauma, vomiting, renal failure, fever, diarrhea

## DOSAGE AND ROUTES

### Type 1 diabetes

**Adult:** SUBCUT prior to each meal (≥30 g carbohydrate), titrate up from 15 mcg to target dose of 60 mcg/dose, each dose titration should occur after no nausea for 3 days

### Type 2 diabetes

**Adult:** SUBCUT 60 mcg prior to each meal (≥30 g CHO), titrate up to 120 mcg SUBCUT with each meal after no nausea for 3-7 days

**Available forms:** PEN 60, 120 (1000 mcg/ml sol for injection)

### Implementation

- Pre-meal insulin should be decreased by 50% when starting and adjusted to therapeutic dose to prevent hypoglycemia

**SUBCUT route**

- Rotate inj sites, allow sol to warm to room temp before use
- Give immediately before mealtime or if 30 g of carbohydrates will be consumed
- Do not use if a meal is skipped
- Do not use if discolored; do not give in arm; absorption is variable
- Store at room temperature for up to 30 days; keep away from heat and sunlight; refrigerate all other supply

## ADVERSE EFFECTS

**CNS:** *Headache,* fatigue, dizziness, confusion
**EENT:** Blurred vision
**GI:** *Nausea, vomiting, anorexia,* abdominal pain
**INTEG:** Inj site reactions, diaphoresis
**META:** Hypoglycemia
**MS:** Arthralgia
**RESP:** *Cough,* pharyngitis
**SYST:** *Systemic allergy*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 30%-40% |
| **Distribution** | Not bound to blood cells or albumin, 40% bound in plasma |
| **Metabolism** | Kidneys |
| **Excretion** | Unknown |
| **Half-life** | 48 min |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 20 min |
| **Duration** | 3 hr |

## INTERACTIONS

### Individual drugs

Acetaminophen: may increase effect of acetaminophen
Alcohol, disopyramide, insulin: increased hypoglycemia
Dextrothyroxine, niacin, triamterene: decreased hypoglycemia
Diphenoxylate, loperamide, octreotide: increased pramlintide action
Erythromycin, metoclopramide: do not use

### Drug classifications

ACE inhibitors, anabolic steroids, androgens, corticosteroids, fibric acid derivatives: increased hypoglycemia
α-Glucosidase inhibitors, antimuscarinics, opiate agonist, tricyclics: increased pramlintide action
Estrogens, MAOIs, oral contraceptives, progestins, thiazide diuretics: decreased hypoglycemia
Phenothiazines: increased hyperglycemia

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Monitor fasting blood glucose, 2 hr postprandial (80-150 mg/dl, normal fasting level; 70-130 mg/dl, normal 2 hr level); A1c may also be drawn to identify treatment effectiveness; also monitor weight, appetite

**BLACK BOX WARNING:** **Assess for hypoglycemic reaction** (sweating, weakness, dizziness, chills, confusion, headache, nausea, rapid weak pulse, fatigue, tachycardia, memory lapses, slurred speech, staggering gait, anxiety, tremors, hunger)

- **Assess for hyperglycemia:** acetone breath, polyuria, fatigue, polydipsia, flushed, dry skin, lethargy
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, usually insulin is used in pregnancy, avoid breastfeeding

### Patient/family education

- Advise patient that product does not cure diabetes but controls symptoms
- Advise patient to carry emergency ID as diabetic
- Teach patient to recognize hypoglycemia reaction: headache, fatigue, weakness, fast pulse
- Teach patient the dosage, route, mixing instructions, if any diet restrictions, disease process

**BLACK BOX WARNING:** Advise patient to carry a glucose source (candy or lump sugar, glucose tabs) to treat hypoglycemia

• Teach patient symptoms of ketoacidosis: nausea, thirst, polyuria, dry mouth, decreased B/P, dry, flushed skin, acetone breath, drowsiness, Kussmaul respirations
• Advise patient that a plan is necessary for diet, exercise; all food on diet should be eaten; exercise routine should not vary
• Teach patient about blood glucose testing; make sure patient is able to determine glucose level
• Advise patient to avoid OTC products unless directed by prescriber, avoid alcohol
• Advise patient not to operate machinery or drive until effect is known
• Teach patient how to use pen

### Evaluation

**Positive therapeutic outcome**
• Decrease in polyuria, polydipsia, polyphagia, clear sensorium; improved A1c, blood glucose; absence of dizziness; stable gait

## TREATMENT OF OVERDOSE:
Glucose 25 g **IV,** via dextrose 50% sol, 50 ml or glucagon 1 mg SUBCUT

## pramoxine topical
*See Appendix B*

**⚠ HIGH ALERT**

## prasugrel (Rx)
(pra′soo-grel)
**Effient**
*Func. class.:* Platelet aggregation inhibitor
*Chem. class.:* ADP receptor antagonist

## ACTION:
Inhibits ADP-induced platelet aggregation

**Therapeutic outcome:** Absence of MI, stroke

## USES:
Reducing the risk of stroke, MI, vascular death, peripheral arterial disease in high-risk patients

## CONTRAINDICATIONS
Hypersensitivity, stroke, TIA

**BLACK BOX WARNING:** Active bleeding

**Precautions:** Pregnancy, breastfeeding, children, hepatic disease, increased bleeding risk, neutropenia, agranulocytosis, renal disease, surgery, trauma, thrombotic thrombocytopenia purpura, Asian patients, weight <60 kg, CABG, geriatric, abrupt discontinuation

## DOSAGE AND ROUTES
**Adult/geriatric <75 yr and ≥60 kg:** PO 60 mg loading dose, then 10 mg qd with aspirin (75-325 mg/day)
**Adult/geriatric <75 yr and <60 kg:** PO 60 mg loading dose, then 5 mg qd
**Geriatric >75 yr:** Not recommended

**Available forms:** Tabs 5, 10 mg

### Implementation
• Give with food to decrease gastric symptoms
• Do not break tablets
• Do not discontinue therapy abruptly

## ADVERSE EFFECTS
**CNS:** Headache, dizziness
**CV:** Edema, atrial fibrillation, bradycardia, chest pain, hyper/hypotension
**GI:** Nausea, vomiting, diarrhea
**HEMA:** Epistaxis, leukopenia, thrombocytopenia, neutropenia, anaphylaxis, angioedema, anemia
**INTEG:** Rash, hypercholesterolemia
**MISC:** Fatigue, intracranial hemorrhage, secondary malignancy, angioedema
**MS:** Back pain

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Liver CYP3A4, CYP2B6 |
| **Excretion** | Urine, feces |
| **Half-life** | 7-8 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 30 min |
| **Duration** | Unknown |

## INTERACTIONS
### Individual drugs
Abciximab, aspirin, eptifibatide, rifampin, tirofiban, ticlopidine, treprostinil: increased bleeding risk

### Drug classifications
Anticoagulants, thrombolytics, NSAIDs, SSRIs: increased bleeding risk

## NURSING CONSIDERATIONS
### Assessment
• **Assess for thrombotic/thrombocytic purpura:** fever, thrombocytopenia, neurolytic anemia
• Monitor hepatic studies: AST, ALT, bilirubin, creatinine (long-term therapy)
• Monitor blood studies: CBC, differential, Hct, Hgb, PT, cholesterol (long-term therapy)

**BLACK BOX WARNING: Bleeding:** may be fatal, decreased B/P in those who have had CABG may be the first indication; bleeding should be controlled while continuing product; may use transfusion; do not use within 1 wk of CABG; may use lower doses in those <60 kg

- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk
- **Beers:** Avoid use in those ≥ 75 yr old, increased bleeding risk

### Patient/family education

- Advise that blood work will be necessary during treatment
- Teach to report any unusual bruising, bleeding to prescriber; that it may take longer to stop bleeding
- Advise to take with food or just after eating to minimize GI discomfort
- Advise to report diarrhea, skin rashes, subcutaneous bleeding, chills, fever, sore throat
- Teach to tell all health care providers that prasugrel is used; may be withheld before surgery

### Evaluation

**Positive therapeutic outcome**
- Absence of stroke, MI

## pravastatin (Rx)

(pra′va-sta-tin)
**Pravachol, PravASA**
Func. class.: Antilipidemic

**Do not confuse:** Pravachol/Prevacid

**ACTION:** Inhibits biosynthesis of VLDL, LDL, which are responsible for cholesterol development, by inhibiting the enzyme HMG-CoA reductase

**Therapeutic outcome:** Decreasing cholesterol levels and LDL, increased HDL

**USES:** As an adjunct in primary hypercholesterolemia types IIa, IIb, III, IV, arthero-sclerosis; to reduce the risk of recurrent MI, primary/secondary CV events; reduce stroke, TIAs

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity, active liver disease

**Precautions:** Past liver disease, alcoholism, severe acute infections, trauma, severe metabolic disorders, electrolyte imbalances, renal disease

## DOSAGE AND ROUTES

**Adult:** PO 40-80 mg/day at bedtime (range 20-80 mg/day), start at 10 mg/day if also on immunosuppressants

**Adolescent 14-18 yr:** PO 40 mg/day
**Child 8-13 yr:** PO 20 mg/day
**Geriatric:** PO 10 mg/day, initially

### Renal dose

**Adult:** PO 10-20 mg daily at bedtime, increase at 4-wk intervals

**Available forms:** Tabs 10, 20, 40, 80 mg

### Implementation

- Give at bedtime only; give 1 hr before or 2 hr after bile acid sequestrants
- Store in cool environment in airtight, light-resistant container

## ADVERSE EFFECTS

**CNS:** Headache, dizziness, fatigue, confusion
**CV:** Chest pain
**EENT:** Lens opacities
**GI:** Nausea, constipation, diarrhea, flatus, abdominal pain, heartburn, liver dysfunction, pancreatitis, hepatitis
**GU:** Renal failure (myoglobinuria)
**INTEG:** Rash, pruritus
**MS:** Muscle cramps, myalgia, myositis, rhabdomyolysis
**RESP:** Common cold, rhinitis, cough

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Poorly absorbed, erratic |
| **Distribution** | Protein binding 80% |
| **Metabolism** | Liver, extensively |
| **Excretion** | Feces (70%-75%); kidneys, unchanged (20%); breast milk (minimal) |
| **Half-life** | 2 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-1½ hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Clarithromycin, clofibrate, cycloSPORINE, erythromycin, gemfibrozil, itraconazole, niacin: increased risk for myopathy

### Drug classifications

Bile acid sequestrants: decreased pravastatin bioavailability
Protease inhibitors: increased risk of myopathy

### Drug/herb

St. John's wort: decreased effect
Red yeast rice: increased adverse reactions
Eucalyptus: increased hepatotoxicity

### Drug/lab test
Increased: CPK, liver function tests
Altered: thyroid function tests

## NURSING CONSIDERATIONS
### Assessment
- Assess nutrition: fat, protein, carbohydrates; nutritional analysis should be completed by dietitian before treatment
- Monitor triglycerides, esterol, cholesterol at baseline, throughout treatment; LDL and HDL should be watched closely; if increased, product should be discontinued
- Rhabdomyolysis: assess for muscle tenderness, pain; obtain CPK; therapy should be discontinued
- Monitor ophth status yearly
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding
- **Renal failure (rare):** Renal studies of patients with compromised renal systems: BUN, I&O ratio, creatinine, that if taking a product like cholestyramine to take this product at least 1 hr before or 4 hr after the bile acid resin

### Patient/family education
- Inform patient that compliance is needed for positive results to occur; not to double doses or skip doses
- Teach patient that risk factors should be decreased: high-fat diet, smoking, alcohol consumption, absence of exercise
- Advise patient to notify prescriber of weakness, tenderness, or limited mobility, blurred vision, severe GI symptoms, dizziness, headache, muscle pain, fever
- Explain to patient that contraception is necessary, since product produces teratogenic effects, pregnancy X, not to breastfeed
- Advise patient to use sunscreen, protective clothing to prevent burns
- **Hepatic disease:** Instruct patient to notify prescriber of lack of appetite, yellow sclera and skin, dark urine, abdominal pain, weakness

### Evaluation
#### Positive therapeutic outcome
- Decreased cholesterol, serum triglyceride levels and improved ratio with HDL

## prazosin (Rx)
(pra′zoe-sin)
**Minipress**
*Func. class.:* Antihypertensive
*Chem. class.:* $\alpha_1$-Adrenergic blocker, peripheral

**ACTION:** Blocks α-mediated vasoconstriction of adrenergic receptors, inducing peripheral vasodilatation

**Therapeutic outcome:** Decreased B/P in hypertension; decreased cardiac preload, afterload

**USES:** Hypertension

**Unlabeled uses:** Benign prostatic hypertrophy to decrease urine outflow obstruction, posttraumatic stress disorder (PTSD), scorpion venom poisoning

## CONTRAINDICATIONS
Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, geriatric patients, prostate cancer, ocular surgery, orthostatic hypotension

## DOSAGE AND ROUTES
### Post-traumatic stress disorder (unlabeled)
**Adult:** PO up to 15 mg/day
**Adolescents ≥ 15 yr:** PO 1 mg at bedtime, then titrated to 1.5-4 mg at bedtime to relieve nightmares

### Hypertension (unlabeled)
**Adult:** PO 1 mg bid or tid, increasing to 20 mg/day in divided doses if required, usual range 6-15 mg/day; max 1 mg initially, max 20-40 mg/day
**Child:** PO 5 mcg/kg q6hr; max 400 mcg/kg/day or 15 mg/day

### Benign prostatic hyperplasia (unlabeled)
**Adult:** PO 2 mg bid

**Available forms:** Caps 1, 2, 5 mg

### Implementation
- Severe hypotension may occur after first dose of this medication; hypotension may be prevented by reducing or discontinuing diuretic therapy 3 days before beginning prazosin therapy
- Give same time each day
- Store in airtight container at 86° F (30° C) or less
- Give without regard to meals
- Store at room temperature

## ADVERSE EFFECTS

**CNS:** *Dizziness, headache, drowsiness,* anxiety, depression, vertigo, *weakness,* fatigue, syncope
**CV:** *Palpitations, orthostatic hypotension,* tachycardia, edema, rebound hypertension
**EENT:** Blurred vision, epistaxis, tinnitus, dry mouth, red sclera
**GI:** *Nausea,* vomiting, diarrhea, constipation, abdominal pain, pancreatitis
**GU:** Urinary frequency, incontinence, impotence, priapism, water and sodium retention

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 60% |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver, extensively; protein binding 97% |
| **Excretion** | Kidneys, unchanged (10%); bile (90%) |
| **Half-life** | 2-3 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 2 hr |
| **Peak** | 1-3 hr |
| **Duration** | 6-12 hr |

## INTERACTIONS

### Individual drugs

Alcohol, nitroglycerin: increased hypotension
CloNIDine: decreased antihypertensive effect

### Drug classifications

Antihypertensives, β-adrenergic blockers, phosphodiesterase inhibitors (vardenafil, tadalafil, sildenafil), diuretics, MAOIs: increased hypotension
NSAIDs: decreased antihypertensive effect

### Drug/herb

Hawthorn: increased antihypertensive effect

### Drug/lab test

Increased: urinary norepinephrine, BUN, uric acid, LFTs
Positive: ANA titer

## NURSING CONSIDERATIONS

### Assessment

- **Hypertension/HF:** Monitor B/P, orthostatic hypotension, syncope; check for edema in feet, legs daily; monitor I&O, weight daily; notify prescriber of changes
- Assess for allergic reactions: rash, fever, pruritus, urticaria; product should be discontinued if antihistamines fail to help
- Assess for orthostatic hypotension; tell patient to rise slowly from sitting or lying position
- **Beers:** Avoid use as an antihypertensive in older adults, high risk of orthostatic hypotension
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excreted in breast milk

### Patient/family education

- Instruct patient not to discontinue product abruptly; stress the importance of complying with dosage schedule, even if feeling better; if dose is missed, take as soon as remembered; take at same time each day
- Advise patient not to use OTC products (cough, cold, allergy) unless directed by prescriber; also to avoid large amounts of caffeine, alcohol, do not crush, chew caps
- Emphasize the need to rise slowly to sitting or standing position to minimize orthostatic hypotension
- Teach patient to notify prescriber of mouth sores, sore throat, fever, swelling of hands or feet, irregular heartbeat, chest pain
- Caution patient to report excessive perspiration, dehydration, vomiting, diarrhea; may lead to fall in B/P
- Caution patient that product may cause dizziness, fainting, light-headedness; may occur during 1st few days of therapy; to avoid hazardous activities
- Teach patient how to take B/P and normal readings for age group; instruct to take B/P q7day

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P in hypertension

## TREATMENT OF OVERDOSE:

Administer volume expanders or vasopressors, discontinue product, place patient in supine position

## prednisoLONE (Rx)

(pred-niss'oh-lone)
**Orapred, Prelone Millipred, Pred-Forte, Prednoral, Veripred**
*Func. class.:* Corticosteroid, synthetic
*Chem. class.:* Intermediate-acting glucocorticoid

**Do not confuse:** prednisoLONE/predniSONE

**ACTION:** Decreases inflammation by suppressing migration of polymorphonuclear leukocytes, fibroblasts; reversal to increase capillary permeability and lysosomal stabilization

**Therapeutic outcome:** Decreased inflammation, decreased adrenal insufficiency

**USES:** Severe inflammation, immunosuppression, neoplasms, asthma

## CONTRAINDICATIONS

Hypersensitivity, fungal infections, varicella, viral infection

**Precautions:** Pregnancy, breastfeeding, children, diabetes mellitus, glaucoma, osteoporosis, seizure disorders, ulcerative colitis, HF, myasthenia gravis, thromboembolism, peptic ulcer disease, renal disease, Cushing syndrome, abrupt discontinuation, children, acute MI, GI ulcers, hypertension, hepatitis, psychosis

## DOSAGE AND ROUTES

### Primary (Addison's disease)/secondary adrenocortical insufficiency or for the treatment of congenital adrenal hyperplasia

**Adult:** PO 5-60 mg/day as a single dose or in divided doses

**Adolescent/child/infant:** PO 0.14-2 mg/kg or 4-60 mg/m$^2$/day in 3-4 divided doses

### Nonsuppurative thyroiditis

**Adult:** PO 5-60 mg/day as a single dose or in divided doses

**Adolescent/child/infant:** PO 0.14-2 mg/kg or 4-60 mg/m$^2$/day in 3-4 divided doses

### Management of symptomatic sarcoidosis; or treatment of hypercalcemia associated with sarcoidosis or with various cancers

**Adult:** PO 5-60 mg/day as a single dose or divided doses

**Adolescent/child/infant:** PO 0.14-2 mg/kg or 4-60 mg/m$^2$/day in 3-4 divided doses

### Adjunct in rheumatic disorders (ankylosing spondylitis, gout with gouty arthritis, juvenile rheumatoid arthritis (JRA)/juvenile idiopathic arthritis (JIA), post-traumatic osteoarthritis psoriatic arthritis, rheumatoid arthritis) or acute episodes or exacerbation of nonrheumatic inflammation (acute and subacute bursitis, epicondylitis, and acute nonspecific tenosynovitis)

**Adult:** PO 5-60 mg/day as a single dose or in divided doses

**Adolescent/child/infant:** PO 0.14-2 mg/kg or 4-60 mg/m$^2$/day in 3-4 divided doses

### Adjunct in carpal tunnel syndrome (unlabeled)

**Adult:** PO 20 mg/day × 2 wk, then 10 mg/day for an additional 2 wk relief

### Maintenance of acute rheumatic carditis, systemic dermatomyositis (polymyositis), systemic lupus erythematosus (SLE); (unlabeled): temporal arteritis, Churg-Strauss syndrome, mixed connective tissue disease, polyarteritis nodosa, relapsing polychondritis, polymyalgia rheumatica, vasculitis, or Wegener's granulomatosis

**Adult:** PO 5-60 mg/day as a single dose or in divided doses

**Adolescent/child/infant:** PO 0.14-2 mg/kg or 4-60 mg/m$^2$/day given in 3-4 divided doses

### Corticosteroid-responsive respiratory disorders (airway-obstructing hemangioma in infant) (unlabeled), aspiration pneumonitis, berylliosis, chronic obstructive pulmonary disease (COPD), laryngotracheobronchitis (croup), Loeffler's syndrome, noncardiogenic pulmonary edema (unlabeled)

**Adult:** PO 5-60 mg/day as a single dose or in divided doses

**Adolescent/child/infant:** PO 0.14-2 mg/kg or 4-60 mg/m$^2$/day in 3-4 divided doses

### Asthma; bronchospasm prophylaxis (unlabeled)

**Adult/adolescent:** PO 40-80 mg/day in 1-2 divided doses until the peak expiratory flow (PEF) reaches 70% of predicted or personal best; total course of treatment is 3-10 days

**Child:** PO 1 mg/kg/day (up to 60 mg) in 2 divided doses until PEF reaches 70% of predicted or personal best; if a patient is given systemic corticosteroids, continue PO corticosteroids for a total course of 3-10 days; tapering is not necessary for courses <1 wk

### Acute asthma exacerbation on an outpatient basis

**Adult/adolescent:** PO 40-60 mg/day as a single dose or in 2 divided doses for 3-10 days

**Child 5-12 yr:** PO 1-2 mg/kg/day (up to 60 mg) in 2 divided doses for 3-10 days

**Infant/child ≤4 yr:** PO 1-2 mg/kg/day (up to 30 mg) in 2 divided doses for 3-10 days

### Long-term prevention of symptoms in severe persistent asthma

**Adult, adolescent, and child ≥12 yr:** PO 7.5-60 mg once daily in the morning or every other day

**Infant and child ≤11 yr:** PO 0.25-2 mg/kg PO daily given as a single dose each morning or every other day

### Thrombocytopenia (immune thrombocytopenia/idiopathic thrombocytopenic purpura (ITP), or secondary thrombocytopenia)

**Adult:** PO 5-60 mg/day as a single dose or in divided doses

**Adolescent/child:** PO 0.14-2 mg/kg or 4-60 mg/m$^2$/day in 3-4 divided doses

**Available forms:** Tabs 5 mg; oral sol 5 mg/5 ml, 10 mg/5 ml, 15 mg/5 ml, 25 mg/5 ml; syrup 5 mg/5 ml; oral dissolving tab 10, 15, 30 mg

### Implementation

- **Oral sol:** use calibrated measuring devices
- **Orally disintegrating tabs:** place on tongue, allow to dissolve, swallow; or swallow whole; do not cut, split

## ADVERSE EFFECTS

**CNS:** *Depression,* flushing, sweating, headache, mood changes

**CV:** *Hypertension,* circulatory collapse, thrombophlebitis, embolism, tachycardia

**EENT:** Fungal infections, increased intraocular pressure, blurred vision

**GI:** *Diarrhea, nausea, abdominal distention,* GI hemorrhage, increased appetite, pancreatitis

**INTEG:** Acne, poor wound healing, ecchymosis, petechiae

**MS:** Fractures, osteoporosis, weakness, arthralgia, myopathy, tendon rupture

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO, IM), completely absorbed (**IV**) |
| **Distribution** | Widely distributed, crosses placenta |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidney, breast milk |
| **Half-life** | 2-4 hr |

### Pharmacodynamics

| | PO | IM (phosphate) | IV | IA/IL |
|---|---|---|---|---|
| **Onset** | 1 hr | Rapid | Rapid | Slow |
| **Peak** | 2 hr | 1 hr | Unknown | Unknown |
| **Duration** | 1½ days | Unknown | Unknown | Up to 1 mo |

## INTERACTIONS

### Individual drugs

Alcohol, amphotericin B, cycloSPORINE, digitalis, indomethacin, NSAIDs: increased side effects

Ambenonium, isoniazid, neostigmine, somatrem: decreased effects of each specific product

Cholestyramine, colestipol, ePHEDrine, phenytoin, rifampin, theophylline: decreased action of prednisoLONE

Indomethacin, ketoconazole: increased action of prednisoLONE

### Drug classifications

Antibiotics (macrolide), contraceptives (oral), estrogens, salicylates: increased action of prednisoLONE

Anticholinesterases, anticoagulants, anticonvulsants, antidiabetics, salicylates, toxoids, vaccines: decreased effects of each specific product

Azole antifungals, cycloSPORINE: increased toxicity

Barbiturates: decreased action of prednisoLONE

CYP3A4 inducers: decreased prednisoLONE effect

CYP3A4 inhibitors: increased prednisoLONE effect

Diuretics, salicylates: increased side effects

Quinolones: increased tendon rupture

### Drug/lab test

Increased: cholesterol, sodium, blood glucose, uric acid, calcium, urine glucose

Decreased: calcium, potassium, $T_4$, $T_3$, thyroid $^{131}I$ uptake test, urine 17-OHCS, 17-KS, PBI

False negative: skin allergy tests

## NURSING CONSIDERATIONS

### Assessment

- Monitor potassium, blood glucose, urine glucose while patient is on long-term therapy; hypokalemia and hyperglycemia may occur
- Monitor weight daily; notify prescriber of weekly gain >5 lb; monitor I&O ratio; be alert for decreasing urinary output and increasing edema
- Monitor B/P q4hr, pulse; notify prescriber if chest pain occurs
- Monitor plasma cortisol levels during long-term therapy (normal level 138-635 nmol/L [SI units] when measured at 8 AM)
- Assess adrenal function periodically for hypothalamic-pituitary-adrenal axis suppression
- **Assess infection:** increased temp, WBC even after withdrawal of medication; product masks infection symptoms
- **Assess for potassium depletion:** paresthesias, fatigue, nausea, vomiting, depression, polyuria, dysrhythmias, weakness, edema, hypertension, cardiac symptoms
- **Adrenal insufficiency:** assess for nausea, vomiting, lethargy, restlessness, confusion

• Assess mental status: affect, mood, behavioral changes, aggression
• Monitor temp; if fever develops, product should be discontinued
• Assess for systemic absorption: increased temp, inflammation, irritation (topical)
• **Pregnancy/breastfeeding:** Not recommended in pregnancy, cautious use in breastfeeding
• **Beers:** Avoid in older adults with or at high risk of delirium

### Patient/family education

• Advise patient to carry/wear emergency ID as steroid user
• Advise patient to notify prescriber if therapeutic response decreases; dosage adjustment may be needed
• Caution patient not to discontinue abruptly; adrenal crisis can result; take exactly as prescribed
• Caution patient to avoid OTC products: salicylates, cough products with alcohol, cold preparations unless directed by prescriber
• Teach patient all aspects of product usage including cushingoid symptoms (moon face, buffalo hump, rapid weight gain, excessive sweating, stretch marks)
• **Teach patient symptoms of adrenal insufficiency:** nausea, anorexia, fatigue, dizziness, dyspnea, weakness, joint pain
• Advise patient that long-term therapy may be needed to clear infection (1-2 mo depending on type of infection)

### Evaluation

**Positive therapeutic outcome**
• Decreased inflammation

## prednisoLONE ophthalmic

*See Appendix B*

## predniSONE (Rx)

(pred′ni-sone)
**Rayos, Winpreo** 🍁
*Func. class.:* Corticosteroid
*Chem. class.:* Intermediate-acting glucocorticoid

**Do not confuse:** predniSONE/methylPREDNISolone/prednisoLONE/PriLOSEC

**ACTION:** Decreases inflammation by increasing capillary permeability and lysosomal stabilization, minimal mineralocorticoid activity

**Therapeutic outcome:** Decreased inflammation, decreased adrenal insufficiency

**USES:** Severe inflammation, neoplasms, multiple sclerosis, collagen disorders, dermatologic disorders

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, diabetes mellitus, glaucoma, osteoporosis, seizure disorders, ulcerative colitis, HF, myasthenia gravis, renal disease, esophagitis, peptic ulcer, cataracts, coagulopathy, abrupt discontinuation, children, corticosteroid hypersensitivity, Cushing syndrome, thromboembolism, geriatrics, acute MI

## DOSAGE AND ROUTES

**Adult:** PO 5-60 mg/day or divided bid-qid
**Child:** PO 0.05-2 mg/kg/day divided 1-4 ×/day

### Nephrotic syndrome

**Child:** PO 2 mg/kg/day in divided doses until urine is protein-free for 3 consecutive days, then 1-1.5 mg/kg/day every other day × 4 wk

### Multiple sclerosis

**Adult:** PO 200 mg/day × 1 wk, then 80 mg every other day × 1 mo

### Asthma

**Adult/adolescent:** PO 40-80 mg/day in 1-2 divided doses until PEF is 70% of predicted or personal best
**Child:** PO 1 mg/kg (max 60 mg)/day in 2 divided doses until PEF is 70% of predicted or personal best

**Available forms:** Tabs 1, 2.5, 5, 10, 20, 50 mg; oral sol 5 mg/5 ml; syr 5 mg/5 ml; del rel tab 1, 2, 5 mg

### Implementation

• Give with food or milk to decrease GI symptoms; use measuring device for liquid route
• For long-term use, alternative product therapy is recommended, to decrease adverse reactions
• **Del rel tab:** swallow whole, do not break, crush, or chew; give once daily

## ADVERSE EFFECTS

**CNS:** Depression, flushing, sweating, headache, mood changes
**CV:** Hypertension, thrombophlebitis, embolism, tachycardia, fluid retention
**EENT:** Fungal infections, increased intraocular pressure, blurred vision
**GI:** Diarrhea, nausea, abdominal distention, GI hemorrhage, increased appetite, pancreatitis
**INTEG:** Acne, poor wound healing, ecchymosis, petechiae
**META:** Hyperglycemia
**MS:** Fractures, osteoporosis, weakness

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed, crosses placenta |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidney, breast milk |
| **Half-life** | 3-4 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-2 hr; del rel 6-6½ hr |
| **Duration** | 1½ days |

## INTERACTIONS

### Individual drugs

Alcohol, amphotericin B, cycloSPORINE, digoxin: increased side effects

Ambenonium, isoniazid, neostigmine, somatrem: decreased effects of each specific product

Cholestyramine, colestipol, phenytoin, rifampin, theophylline: decreased action of predniSONE

Ketoconazole: increased action of predniSONE

NSAIDs: increased side effects, increased action of predniSONE

### Drug classifications

Anticholinesterases, anticoagulants, anticonvulsants, antidiabetics, toxoids, vaccines: decreased effects of each specific product

Antiinfectives (macrolide), contraceptives (oral), estrogens: increased action of predniSONE

Barbiturates: decreased action of predniSONE

CYP3A4 inducers: decreased predniSONE effect

CYP3A4 inhibitors: increased predniSONE effect

Diuretics: increased side effects

Quinolones: increased tendon rupture

Salicylates: increased side effects, increased action of predniSONE, decreased effects of salicylates

### Drug/herb

Ephedra (ma huang): decreased predniSONE effect

### Drug/lab test

Increased: cholesterol, sodium, blood glucose, uric acid, calcium, urine glucose

Decreased: calcium, potassium, $T_4$, $T_3$, thyroid $^{131}I$ uptake test, urine 17-OHCS, 17-KS, PBI

False negative: skin allergy tests

## NURSING CONSIDERATIONS

### Assessment

- **Adrenal insufficiency:** assess for nausea, vomiting, anorexia, confusion, hypotension, weight loss before and during treatment; HPA suppression may be precipitated by abrupt withdrawal
- Monitor potassium, blood glucose, urine glucose while on long-term therapy; hypokalemia and hyperglycemia may occur
- Monitor weight daily; notify prescriber of weekly gain >5 lb; monitor I&O ratio; be alert for decreasing urinary output and increasing edema, rales/crackles, notify provider if present
- Monitor B/P, pulse; notify prescriber if chest pain occurs
- Monitor plasma cortisol levels during long-term therapy (normal level 138-635 nmol/L when measured at 8 AM)
- Assess adrenal function periodically for hypothalamic-pituitary-adrenal axis suppression
- Assess infection: increased temp, WBC even after withdrawal of medication; product masks infection symptoms
- **Assess for potassium depletion:** paresthesias, fatigue, nausea, vomiting, depression, polyuria, dysrhythmias, weakness, edema, hypertension, cardiac symptoms
- Assess mental status: affect, mood, behavioral changes, aggression
- Monitor temp; if fever develops, product should be discontinued
- Assess for systemic absorption: increased temp, inflammation, irritation (topical)
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed
- **Beers:** Avoid in older adults with a high risk of delirium

### Patient/family education

- Advise patient that emergency ID as corticosteroid user should be carried or worn
- Advise patient to notify prescriber if therapeutic response decreases; dosage adjustment may be needed
- Caution patient not to discontinue abruptly; adrenal crisis can result
- Caution patient to avoid OTC products: salicylates, cough products with alcohol, cold preparations unless directed by prescriber
- Teach patient all aspects of product use including cushingoid symptoms
- Teach patient symptoms of adrenal insufficiency: nausea, anorexia, fatigue, dizziness, dyspnea, weakness, joint pain
- Advise patient that long-term therapy may be needed to clear infection (1-2 mo depending on type of infection)
- **Pregnancy:** Teach patient to notify prescriber if pregnancy is planned or suspected; cleft palate, stillbirth, abortion reported

### Evaluation

**Positive therapeutic outcome**
- Decreased inflammation

## pregabalin (Rx)

(pre-gab'a-lin)
**Lyrica**
*Func. class.:* Anticonvulsant
**Controlled substance schedule V**

**ACTION:** Binds to high-voltage–gated calcium channels in CNS tissues; this may lead to anticonvulsant action, similar to the inhibitory neurotransmitter GABA; anxiolytic, analgesic, and antiepileptic properties

**Therapeutic outcome:** Decreased seizure activity, decreased neuropathic pain

**USES:** Neuropathic pain associated with spinal cord injury, diabetic peripheral neuropathy, partial-onset seizures, postherpetic neuralgia, fibromyalgia

**Unlabeled uses:** Moderate pain, social anxiety disorder, generalized anxiety disorder

## CONTRAINDICATIONS

Hypersensitivity to this product or gabapentin, abrupt discontinuation

**Precautions:** Pregnancy, breastfeeding, children <12 yr, geriatric, renal disease, PR interval prolongation, creatine kinase elevations, HF (class III, IV), decreased platelets, drug abuse, dependence, glaucoma, myopathy, angioedema history, suicidal behavior

## DOSAGE AND ROUTES

### Diabetic peripheral neuropathic pain

**Adult:** PO/oral sol 50 mg tid, may increase to 300 mg/day (max) within 1 wk, adjust in renal disease

### Partial onset seizures

**Adult:** PO/oral sol 75 mg bid or 50 mg tid; may increase to 600 mg/day (max)

### Postherpetic neuralgia

**Adult:** PO/oral sol 150 mg/day in 2-3 doses, may increase to 300 mg/day in 2-3 divided doses, if higher dose is needed in 2-4 wk, may increase to 600 mg/day in 2-3 divided doses

### Fibromyalgia, spinal cord injury/pain

**Adult:** PO/oral sol 75 mg bid, may increase to 150 mg bid within 1 wk and 225 mg bid after 1 wk

### Renal dose

PO CCr 30-60 ml/min 75-300 mg/day in 2-3 divided doses; CCr 15-30 ml/min 25-150 mg/day in 1-2 divided doses, CCr <15 ml/min 25-75 mg/day in a single dose

**Available forms:** Caps 25, 50, 75, 100, 150, 200, 225, 300 mg; oral sol 20 mg/ml

### Implementation

- Do not crush or chew caps; caps may be opened and contents put in applesauce or dissolved in juice
- Give without regard to meals
- Gradually withdraw over 7 days; abrupt withdrawal may precipitate seizures
- Store at room temperature away from heat and light
- Give hard candy, frequent rinsing of mouth, gum for dry mouth
- Provide assistance with ambulation during early part of treatment; dizziness occurs
- Provide seizure precautions: padded side rails; move objects that may harm patient
- Provide increased fluids, bulk in diet for constipation
- **Oral sol:** should be written in mg and calculated to mL

## ADVERSE EFFECTS

**CNS:** *Drowsiness, dizziness,* abnormal thinking
**EENT:** *Dry mouth,* blurred vision, sinusitis
**GI:** Constipation, abdominal pain, weight gain, nausea, vomiting, increased appetite
**HEMA:** thrombocytopenia
**MS:** Back pain, rhabdomyolysis, myopathy
**MISC:** Pruritus, *peripheral edema*, angioedema, suicidal ideation, drowsiness

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Not bound to plasma proteins |
| **Metabolism** | Negligible |
| **Excretion** | 90% unchanged, urine |
| **Half-life** | 6 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1.5 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression

### Drug classifications

Anxiolytics, barbiturates, general anesthetics, hypnotics, opiate agonists, phenothiazines,

sedating $H_1$ blockers, sedatives, thiazolidinediones, tricyclics: increased CNS depression
Thiazolidinediones: increased weight gain/fluid retention; avoid use if possible

### Drug/lab test
Increased: creatine kinase
Decreased: platelets

## NURSING CONSIDERATIONS
### Assessment
- **Assess for seizures:** aura, location, duration, activity at onset, use seizure precaution
- **Assess for pain:** location, duration, characteristics if using for diabetic neuropathy, spinal cord injury, neuralgia
- Monitor renal function tests: urinalysis, BUN, urine creatinine q3mo, creatine kinase; if markedly increased, discontinue
- **Assess mental status:** mood, sensorium, affect, behavioral changes, suicidal thoughts, behavior; if mental status changes, notify prescriber
- **Angioedema/hypersensitivity:** monitor for blisters, hives, rash, dyspnea, wheezing; angioedema; if these occur discontinue: cross-hypersensitivity with this product and gabapentin may occur
- **Rhabdomyolysis and creatinine kinase elevations (rare):** monitor for muscle pain, tenderness, weakness accompanied by malaise or fever; product should be discontinued
- Hemolytic anemia may be severe in Asian, Mediterranean individuals
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, may cause fetal toxicity, pregnant patients should enroll in the Antiepileptic Drug Pregnancy Registry 888-233-2334, do not breastfeed
- **Beers:** Avoid in older adults unless safer alternative is not available, may cause ataxia, impaired psychomotor function

### Patient/family education
- Advise patient to carry emergency ID stating patient's name, products taken, condition, prescriber's name and phone number
- Advise patient to avoid driving, other activities that require alertness: dizziness, drowsiness may occur
- Teach patient not to discontinue medication quickly after long-term use, taper over ≥1 wk; withdrawal-precipitated seizures may occur, not to double doses if dose is missed, take if 2 hr or more before next dose
- Teach patient to notify prescriber if pregnancy is planned or suspected; avoid breastfeeding
- Teach patient to report muscle pain, tenderness, weakness, when accompanied by fever, malaise
- Advise patient to avoid alcohol, live virus vaccines

### Evaluation
**Positive therapeutic outcome**
- Decreased seizure activity; decrease in neuropathic pain

## TREATMENT OF OVERDOSE:
Lavage, VS, hemodialysis

**RARELY USED**

## primidone (Rx)
(pri′mi-done)
**Mysoline, Sertan**
*Func. class.:* Anticonvulsant
*Chem. class.:* Barbiturate derivative

**Therapeutic outcome:** Reduction in seizure activity

**USES:** Generalized tonic-clonic (grand mal), complex

## CONTRAINDICATIONS
Pregnancy, hypersensitivity to this product or barbiturates, porphyria, breastfeeding

## DOSAGE AND ROUTES
**Adult and child >8 yr:** PO 125-250 mg at bedtime, increase by 125-250 mg/day q3-7day, usual dose 750-1500 mg/day in 3-4 divided doses, max 2 g/day in divided doses
**Child <8 yr:** PO 50-125 mg at bedtime, increase by 50-125 mg/day q3-7day, usual dose 10-25 mg/kg/day in 3-4 divided doses

**Neonate:** PO 12-20 mg/kg/day in 2-4 divided doses, start at lower dose and titrate

### Renal dose
**Adult:** CCr 10-15 ml/min: increase interval between doses to 8-12 hr; CCr <10 ml/min: increase interval to 12-24 hr

**⚠ HIGH ALERT**

## procainamide (Rx)
(proe′kane-ah-mide)
**Procan SR**
*Func. class.:* Antidysrhythmic (class IA)
*Chem. class.:* Procaine HCl amide analog

**ACTION:** Depresses excitability of cardiac muscle to electrical stimulation and slows conduction velocity in atrium, bundle of His, ventricle; increases refractory period

**Therapeutic outcome:** Prevention of dysrhythmias

## USES:
Life-threatening ventricular dysrhythmias, paroxysmal atrial tachycardia, PSVT, Wolff-Parkinson-White (WPW) syndrome

## CONTRAINDICATIONS
Hypersensitivity, severe heart block, torsades de pointes

**BLACK BOX WARNING:** Lupus erythromatosis

**Precautions:** Pregnancy, breastfeeding, children, renal/hepatic disease, HF, respiratory depression, cytopenia, dysrhythmia associated with digoxin toxicity, myasthenia gravis, digoxin toxicity

**BLACK BOX WARNING:** Bone marrow failure, cardiac arrhythmias

## DOSAGE AND ROUTES
### Ventricular tachycardia during CPR
**Adult:** IV loading dose 20 mg/min; either ventricular tachycardia resolves or patient becomes hypotensive; the QRS complex is widened by 50% of original width or total is 17 mg/kg (1.2 g for a 70 kg patient); may give up to 50 mg/min in urgent situations; maintenance 1-4 mg/min CONT IV INF; IM 50 mg/kg/day in divided doses q3-6hr
**Child:** IV PALS 15 mg/kg over 30-60 min

### Renal dose
**Adult:** IV CCr 35-59 ml/min give 70% of maintenance dose; CCr 15-34 ml/min give 40%-60% maintenance dose; CCr <15 ml/min individualized

**Available forms:** inj 100, 500 mg/ml

### Implementation
**IM route**
- IM inj in deltoid; aspirate to avoid intravascular administration, use only when unable to use IV

**Direct IV route**
- Dilute each 100 mg/10 ml of 0.9% NaCl, give at max 50 mg/min

**Intermittent INF route**
- Dilute 0.2-1 g/50-500 ml of $D_5W$ (2-4 mg/ml) give over 30-60 min at max 25-50 mg/min, use inf pump

**Y-site compatibilities:** Alfentanil, amikacin, aminocaproic acid, aminophylline, amiodarone, amphotericin B lipid complex, amphotericin B liposome, anidulafungin, ascorbic acid, atenolol, atracurium, atropine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, caspofungin, ceFAZolin, cefmetazole, cefonicid, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, cefTRIAXone, cefuroxime, cephalothin, chlorproMAZINE, cimetidine, cisatracurium, CISplatin, clindamycin, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, digoxin, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doxacurium, DOXOrubicin, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, epoetin alfa, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, folic acid, furosemide, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, IDArubicin, ifosfamide, indomethacin, insulin (regular), irinotecan, isoproterenol, ketorolac, labetalol, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, meperidine, metaraminol, methicillin, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, mezlocillin, miconazole, midazolam, mitoXANtrone, morphine, moxalactam, multiple vitamins, mycophenolate, nafcillin, nalbuphine, naloxone, netilmicin, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, pantoprazole, papaverine, PEMEtrexed, penicillin G potassium/sodium, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phenylephrine, phytonadione, piperacillin, piperacillin-tazobactam, polymyxin B, potassium chloride, prochlorperazine, promethazine, propranolol, protamine, pyridoxine, quiNIDine, quinupristin-dalfopristin, ranitidine, remifentanil, ritodrine, rocuronium, sodium bicarbonate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, vitamin B complex/C, voriconazole, zoledronic acid

**Y-site incompatibilities:** Milrinone

## ADVERSE EFFECTS
**CNS:** *Headache, dizziness,* confusion, psychosis, restlessness, irritability, weakness, depression
**CV:** *Hypotension,* heart block, cardiovascular collapse, arrest, torsades de pointes
**GI:** Nausea, vomiting, anorexia, diarrhea, hepatomegaly, pain, bitter taste
**HEMA:** Systemic lupus erythematosus syndrome, agranulocytosis, thrombocytopenia, neutropenia, hemolytic anemia

P

**INTEG:** Rash, urticaria, edema, swelling (rare), pruritus, flushing, angioedema
**SYST:** SLE

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Rapidly distributed, protein binding 15% |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, unchanged (50%-70%) |
| **Half-life** | 2½-4½ hr; increased in renal disease |

### Pharmacodynamics

| | IV |
|---|---|
| **Onset** | Rapid |
| **Peak** | ½-1 hr |
| **Duration** | 3-4 hr |

## INTERACTIONS

### Individual drugs

Cimetidine, quiNIDine, ranitidine, trimethoprim: increased procainamide effect
Thioridazine: increased toxicity

### Drug classifications

Antidysrhythmics, quinolones: increased toxicity
β-Adrenergic blockers: increased procainamide effects
Neuromuscular blockers: increased neuromuscular blocking effect

### Drug/lab test

Increased: ALT, AST, alkaline phosphatase, LDH, bilirubin

## NURSING CONSIDERATIONS

### Assessment

- Assess for oxygenation or perfusion deficit: decreased B/P, chest pain, dizziness, loss of consciousness
- Assess respiratory status: auscultate lung fields for bibasilar crackles in patients with advanced HF
- Monitor I&O ratio; electrolytes: potassium, sodium, chloride; watch for decreasing urinary output, possible retention
- Monitor liver function tests: AST, ALT, bilirubin, alkaline phosphatase

**BLACK BOX WARNING: Cardiac dysrhythmias:** Monitor ECG continuously to determine product effectiveness; measure PR, QRS, QT intervals; check for PVCs, other dysrhythmias; check B/P continuously for hypo/hypertension; for rebound hypertension after 1-2 hr; prolonged PR/QT intervals, QRS complex; if QT or QRS increases by 50% or more, withhold next dose, notify prescriber

- Monitor ANA titer; during long-term treatment, watch for lupuslike symptoms
- Monitor for dehydration or hypovolemia
- **Monitor for CNS symptoms:** confusion, seizures, psychosis, numbness, depression, involuntary movements; if these occur, product should be discontinued

**BLACK BOX WARNING: Bone marrow suppression:** CBC q2wk × 3 mo; leukocyte, neutrophil, platelet counts may be decreased, treatment may need to be discontinued

- Monitor blood levels (therapeutic level 4-10 mcg/ml), ANA titer or *N*-acetylprocainamide levels 10-20 mcg/ml; notify prescriber of abnormal results; assess for toxicity: confusion, drowsiness, nausea, vomiting, tachydysrhythmias, oliguria
- Assess cardiac rate, respiration: rate, rhythm, character, chest pain, ventricular tachycardia, supraventricular tachycardia or fibrillation
- **Pregnancy/breastfeeding:** Use only if clearly needed, do not breastfeed

### Patient/family education

- Advise patient to report side effects immediately to prescriber; to take exactly as prescribed; if dose is missed take when remembered if within 3-4 hr of next dose, do not double doses
- Caution patient that dark glasses may be needed for photophobia; to use sunscreen or stay out of sun to prevent burns; avoid temperature extremes; impairment of heat-regulating mechanism can occur
- Advise patient to complete follow-up appointment with prescriber, including pulmonary function tests, chest x-ray
- Instruct patient that dry mouth may be relieved by frequent sips of water, hard candy, sugarless gum
- Caution patient to make position changes from lying to standing slowly to prevent orthostatic hypotension

**BLACK BOX WARNING:** Advise prescriber immediately if lupuslike symptoms (joint pain, butterfly rash, fever, chills, dyspnea), leukopenia symptoms (sore mouth, gums, throat), or thrombocytopenia symptoms (bleeding, bruising) occur

- Teach patient how to take pulse and when to report to prescriber

### Evaluation

**Positive therapeutic outcome**

- Decreased PVCs, ventricular tachycardia

## TREATMENT OF OVERDOSE:
$O_2$, artificial ventilation, ECG, administer DOPamine for circulatory depression, diazepam or thiopental for seizures, isoproterenol

**⚠ HIGH ALERT**

# procarbazine (Rx)
(proe-kar'ba-zeen)
**Matulane, Natulan** 🍁
*Func. class.:* Antineoplastic, alkylating agent
*Chem. class.:* Hydrazine derivative

**Do not confuse:** Matulane/Materna

**ACTION:** Inhibits DNA, RNA, protein synthesis; has multiple sites of action; a nonvesicant

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** Lymphoma, Hodgkin's disease, cancers resistant to other therapy

**Unlabeled uses:** Brain, lung malignancies, other lymphomas, multiple myeloma, malignant melanoma, polycythemia vera

## CONTRAINDICATIONS
Pregnancy, breastfeeding, hypersensitivity, thrombocytopenia, bone marrow depression

**Precautions:** Cardiac/renal/hepatic disease, radiation therapy, seizure disorder, anemia, bipolar disorder, Parkinson's disease

**BLACK BOX WARNING:** Requires a specialized care setting and an experienced clinician

## DOSAGE AND ROUTES
**Adult:** PO 2-4 mg/kg/day for first wk; maintain dosage of 4-6 mg/kg/day until platelets and WBC fall; after recovery, 1-2 mg/kg/day
**Child:** PO 50 mg/m$^2$/day for 7 days, then 100 mg/m$^2$ until desired response, leukopenia, or thrombocytopenia occurs; 50 mg/m$^2$/day is maintenance after bone marrow recovery

**Available forms:** Caps 50 mg

### Implementation
• Give with foods, fluids for GI upset; open cap and give with food/fluids for swallowing difficulty; administer as directed

## ADVERSE EFFECTS
**CNS:** Headache, dizziness, seizures, insomnia, hallucinations, confusion, coma, pain, chills, fever, sweating, paresthesias, peripheral neuropathy
**EENT:** Retinal hemorrhage, nystagmus, photophobia, diplopia, dry eyes
**GI:** *Nausea, vomiting,* anorexia, diarrhea, constipation, dry mouth, stomatitis, elevated hepatic enzymes
**GU:** Azoospermia, cessation of menses
**HEMA:** Thrombocytopenia, anemia, leukopenia, myelosuppression, bleeding tendencies, purpura, petechiae, epistaxis, hemolysis
**INTEG:** *Rash,* pruritus, dermatitis, alopecia, herpes, hyperpigmentation
**MS:** Arthralgias, myalgias
**RESP:** Cough, pneumonitis, hemoptysis
**SYST:** Secondary malignancy

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed, crosses blood-brain barrier |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | 1 hr |

### Pharmacodynamics
Unknown

## INTERACTIONS
### Individual drugs
Alcohol: increased CNS depression
Caffeine, guanethidine, levodopa, methyldopa, reserpine: increased hypertension
Meperidine: hypotension; do not use together

### Drug classifications
Anticoagulants, NSAIDs, platelet inhibitors, thrombolytics: increased bleeding risk
Antidepressants (tricyclics), MAOIs, SSRIs, SNRIs: confusion, seizures, hypertension
Antihistamines, barbiturates, hypotensive agents, opiates, phenothiazines: increased CNS depression
Sympathomimetics: disulfiram-like reaction, life-threatening hypertensive crisis

### Drug/food
Tyramine-containing foods: increased disulfiram-like reaction, hypertensive crisis

## NURSING CONSIDERATIONS
### Assessment
• **Bone marrow suppression:** monitor CBC, differential, platelet count weekly; withhold product if WBC is <4000/mm$^3$ or platelet count is <75,000/mm$^3$; notify prescriber of results if WBC <20,000/mm$^3$, platelets <150,000/mm$^3$
• Monitor pulmonary function tests, chest x-ray films before, during therapy; chest film should be obtained q2wk during treatment; check for dyspnea, crackles, unproductive cough, chest pain, tachypnea

• **Hepatic/renal disease:** can cause accumulation of drug, increased toxicity; monitor renal function tests: BUN, serum uric acid, urine CCr before, during therapy; I&O ratio; report fall in urine output of 30 ml/hr; check for decreased hyperuricemia; monitor hepatic studies before, during therapy: bilirubin, AST, ALT, ALK phos, LDH, PRN or qmo

**BLACK BOX WARNING:** To be used only in a specialized care setting with emergency equipment

**BLACK BOX WARNING:** To be given only by an experienced clinician knowledgeable in cytotoxic products

• Monitor for cold, fever, sore throat (may indicate beginning of infection); identify edema in feet, joint and stomach pain, shaking; prescriber should be notified
• **Assess for bleeding:** hematuria, guaiac, bruising or petechiae, mucosa or orifices; no rectal temp
• Assess for tyramine-containing foods in the diet; hypertensive crisis can occur
• **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

• Teach patient to avoid use of products containing aspirin or NSAIDs, razors, commercial mouthwash, since bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools)
• Caution patient to report signs of anemia (fatigue, headache, irritability, faintness, shortness of breath); CNS changes, diarrhea
• Advise patient to report any changes in breathing or coughing even several mo after treatment; to avoid crowds and persons with respiratory tract or other infections
• Inform patient hair loss is common; discuss the use of wigs or hairpieces
• Caution patient not to have any vaccinations without the advice of the prescriber; serious reactions can occur
• Advise patient that contraception is needed during treatment and for several mo after the completion of therapy; may cause infertility; do not breastfeed
• Teach patient to avoid sunlight, UV exposure; wear sunscreen or protective clothing

### Evaluation

**Positive therapeutic outcome**
• Absence of swelling at night
• Increased appetite, increased weight
• Decreasing malignancy

## prochlorperazine (Rx)

(proe-klor-pair'a-zeen)
**Compro, Prochlorazine**
*Func. class.:* Antiemetic/antipsychotic
*Chem. class.:* Phenothiazine, piperazine derivative

**Do not confuse:** prochlorperazine/chlorproMAZINE

**ACTION:** Decreases DOPamine neurotransmission by increasing DOPamine turnover through blockade of the $D_2$ somatodendritic autoreceptor in the meso-limbic system

**Therapeutic outcome:** Decreased nausea, vomiting, decreased signs and symptoms of psychosis

**USES:** Nausea, vomiting, psychosis

## CONTRAINDICATIONS

Hypersensitivity to phenothiazines, coma, infants/neonates/child <2 yr or <20 lb, surgery

**Precautions:** Pregnancy, breastfeeding, geriatric, seizure, encephalopathy, glaucoma, hepatic disease, Parkinson's disease, BPH

**BLACK BOX WARNING:** Increased mortality in elderly patients with dementia-related psychosis

## DOSAGE AND ROUTES

### Postoperative nausea/vomiting

**Adult:** IM 5-10 mg 1-2 hr before anesthesia; may repeat in 30 min; **IV** 5-10 mg 15-30 min before anesthesia; **IV** INF 20 mg/L $D_5W$ or 0.9% NaCl 15-30 min before anesthesia, max 40 mg/day

### Severe nausea/vomiting

**Adult:** PO 5-10 mg tid-qid; SUS REL 15 mg/day in AM or 10 mg q12hr; RECT 25 mg/bid; IM 5-10 mg; may repeat q3-4hr prn, max 40 mg/day
**Child 18-39 kg:** PO 2.5 mg tid or 5 mg bid; IM 0.132 mg/kg, q3-4hr prn, max 15 mg/day
**Child 14-17 kg:** PO/RECT 2.5 mg bid-tid; IM 0.132 mg/kg, q3-4hr prn, max 10 mg/day
**Child 9-13 kg:** PO/RECT 2.5 mg daily-bid; IM 0.132 mg/kg, q3-4hr prn, max 7.5 mg/day

### Antipsychotic

**Adult and child ≥12 yr:** PO 5-10 mg tid-qid; may increase q2-3day, max 150 mg/day; IM 10-20 mg q2-4hr up to 4 doses, then 10-20 mg q4-6hr, max 200 mg/day; RECT 10 mg tid-qid, may increase by 5-10 mg q2-3day as needed
**Child 2-12 yr:** PO 2.5 mg bid-tid; IM 0.132 mg/kg, change to oral ASAP

### Antianxiety

**Adult and child ≥12 yr:** PO 5 mg tid-qid, max 20 mg/day or >12 wk; IM 5-10 mg q3-4hr, max 40 mg/day; **IV** 2.5-10 mg; max 40 mg/day
**Child 2-12 yr:** IM 0.132 mg/kg, change to oral ASAP

**Available forms:** Syr 5 mg/ml; inj 5 mg/ml; tabs 5, 10, 25 mg; sus rel caps 10, 15 mg; supp 2.5, 5, 25 mg; solution for injection 5 mg/ml

### Implementation

**IM route**

- Inject slowly in deep muscle mass; do not give SUBCUT; aspirate to avoid **IV** administration; do not administer sol with a precipitate; have patient lie down afterward for at least 30 min

**Direct IV route**

- No dilution needed, inject directly in a vein ≤5 mg/min, do not give as bolus

**Intermittent IV infusion route**

- May dilute 20 mg/L NaCl and give as inf 15-30 min prior to anesthesia induction

**Y-site compatibilities:** Amsacrine, calcium gluconate, CISplatin, cladribine, cyclophosphamide, cytarabine, DOXOrubicin, fluconazole, granisetron, heparin, hydrocortisone, melphalan, methotrexate, ondansetron, PACLitaxel, potassium chloride, propofol, sargramostim, SUFentanil, teniposide, thiotepa, vinorelbine, vit B/C

**Y-site incompatibilities:** Foscarnet

## ADVERSE EFFECTS

**CNS:** Tardive dyskinesia, *euphoria,* depression, EPS, restlessness, tremor, dizziness, neuroleptic malignant syndrome, drowsiness, headache
**CV:** Circulatory failure, tachycardia, hypotension, ECG changes
**EENT:** Blurred vision
**GI:** Nausea, vomiting, anorexia, dry mouth, diarrhea, constipation, weight loss, metallic taste, cramps
**HEMA:** Agranulocytosis
**MISC:** Impotence
**RESP:** Respiratory depression

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Variably absorbed (PO); well absorbed (IM) |
| **Distribution** | Widely distributed, high concentration in CNS, crosses placenta |
| **Metabolism** | Liver, extensively; GI mucosa |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | Unknown |

### Pharmacodynamics

| | PO | PO-SUS REL | RECT | IM | IV |
|---|---|---|---|---|---|
| **Onset** | ½ hr | Unkn | 1 hr | 10-20 min | 4-5 min |
| **Peak** | Unkn | Unkn | Unkn | Unkn | Unkn |
| **Duration** | 3-4 hr | 10-12 hr | 3-4 hr | 4-6 hr; children: 12 hr | 3-4 hr |

## INTERACTIONS

### Individual drugs

Lithium: decreased prochlorperazine effect

### Drug classifications

Antacids, barbiturates: decreased prochlorperazine effect
Anticholinergics, antidepressants, antiparkinson products: increased anticholinergic effects
SSRIs, SNRIs: increased serotonin syndrome, increased neuroleptic malignant syndrome
CNS depressants: increased CNS depression

### Drug/herb

Betel palm, kava: increased EPS
Dong quai: avoid use

### Drug/lab test

Increased: liver function tests, cardiac enzymes, cholesterol, blood glucose, prolactin, bilirubin, PBI, $^{131}I$, alkaline phosphatase, leukocytes, granulocytes, platelets
Decreased: hormones (blood and urine)
False positive: pregnancy tests, urine bilirubin
False negative: urinary steroids, 17-OHCS, pregnancy tests

## NURSING CONSIDERATIONS

### Assessment

- Assess mental status: orientation, mood, behavior, presence and type of hallucinations before initial administration and monthly; this product should significantly reduce psychotic behavior
- Check for swallowing of PO medication; check for hoarding or giving of medication to other patients
- Monitor I&O ratio; palpate bladder if low urinary output occurs, especially in geriatric; urinalysis recommended before, during prolonged therapy
- Monitor bilirubin, CBC, liver function tests monthly; blood dyscrasias, hepatotoxicity may occur
- Assess affect, orientation, LOC, reflexes, gait, coordination, sleep pattern disturbances

• Monitor B/P with patient sitting, standing, and lying; take pulse and respirations q4hr during initial treatment; establish baseline before starting treatment; report drops of 30 mm Hg; obtain baseline ECG, Q-wave and T-wave changes
• Check for dizziness, faintness, palpitations, tachycardia on rising; severe orthostatic hypotension is common
• **Identify neuroleptic malignant syndrome:** hyperpyrexia, muscle rigidity, increased CPK, altered mental status, seizures, fever, tachycardia, dyspnea, fatigue, loss of bladder control; notify prescriber immediately; product should be discontinued
• Assess for EPS including akathisia (inability to sit still, no pattern to movements), tardive dyskinesia (bizarre movements of the jaw, mouth, tongue, extremities), pseudoparkinsonism (ragged tremors, pill rolling, shuffling gait); an antiparkinsonism product should be prescribed
• Assess for constipation, urinary retention daily; if these occur, increase bulk, water in diet
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, EPS may result, cautious use in breastfeeding, excreted in breast milk
• **Beers:** Avoid in older adults with a high risk of delirium

### Patient/family education

• Teach patient to use good oral hygiene; frequent rinsing of mouth, sugarless gum for dry mouth since oral candidiasis may occur
• Caution patient to avoid hazardous activities until product response is determined; dizziness, blurred vision may occur
• Inform patient that orthostatic hypotension occurs often and to rise from sitting or lying position gradually; to remain lying down after IM inj for at least 30 min; tell patient to avoid hot tubs, hot showers, tub baths, since hypotension may occur; tell patient that in hot weather heat stroke may occur; take extra precautions to stay cool
• Advise patient to avoid abrupt withdrawal of this product, or EPS may result; product should be withdrawn slowly
• Teach patient to avoid OTC preparations (cough, hay fever, cold) unless approved by prescriber, since serious product interactions may occur; avoid use with alcohol, CNS depressants; increased drowsiness may occur; avoid activities requiring mental alertness
• Instruct patient to avoid sun or use sunscreen, sunglasses, and protective clothing to prevent burns
• Advise patient to take antacids 2 hr before or after taking this product
• Advise patient to report sore throat, malaise, fever, bleeding, mouth sores; if these occur, CBC should be done and product discontinued
• Teach patient not to double or skip doses
• Inform patient that urine may turn pink to reddish brown
• Instruct patient to report dark urine, clay-colored stools, bleeding, bruising, rash, blurred vision
• Advise patient that suppositories may contain coconut/palm oil

### Evaluation

**Positive therapeutic outcome**
• Relief of nausea and vomiting
• Decrease in emotional excitement, hallucinations, delusions, paranoia
• Reorganization of patterns of thought, speech

**TREATMENT OF OVERDOSE:** Lavage if orally ingested; provide airway; *do not induce vomiting or use EPINEPHrine*

## progesterone (Rx)

(proe-jess'ter-one)
**Crinone, Endometrin, Prometrium**
*Func. class.:* Progestogen
*Chem. class.:* Progesterone derivative

**ACTION:** Inhibits secretion of pituitary gonadotropins, which prevents follicular maturation, ovulation; stimulates growth of mammary tissue; antineoplastic action against endometrial cancer

**Therapeutic outcome:** Decreased abnormal uterine bleeding, absence of amenorrhea

**USES:** Contraception, amenorrhea, premenstrual syndrome, abnormal uterine bleeding, endometrial hyperplasia prevention, assisted reproductive technology (ART) gel

**Unlabeled uses:** Corpus luteum insufficiency

**CONTRAINDICATIONS**
Pregnancy, thromboembolic disorders, reproductive cancer, genital bleeding (abnormal, undiagnosed), cerebral hemorrhage, ectopic pregnancy, PID, STDs, thrombophlebitis, hypersensitivity to this product, peanuts, or peanut oil

**BLACK BOX WARNING:** Breast cancer

**Precautions:** Breastfeeding, hypertension, asthma, blood dyscrasias, gallbladder disease, HF, diabetes mellitus, bone disease, depression, migraine headache, seizure disorders, renal/hepatic disease, family history of breast or reproductive tract cancer

**BLACK BOX WARNING:** Cardiac disease, dementia

## DOSAGE AND ROUTES

### Infertility
**Adult:** Vag 90 mg/day (micronized gel); 100 mg 2-3 times/day, starting day after oocyte retrieval and up to 10 wk total

### Amenorrhea/functional uterine bleeding
**Adult:** IM 5-10 mg/day × 6-8 doses

### Endometrial hyperplasia prevention
**Adult:** PO 200 mg/day × 12 days

### Assisted reproductive technology
**Adult:** GEL 90 mg (8%) vaginally daily, for supplementation; 90 mg (8%) vaginally bid for replacement; if pregnancy occurs, continue × 10-12 wk

### Corpus luteum insufficiency (unlabeled)
**Adult:** VAG insert 90-100 mg bid-tid starting at oocyte retrieval and continuing up to 10-12 wk of gestation

**Available forms:** Caps 100, 200 mg; inj 50 mg/ml; powder micronized; vag gel 4%, 8%; vag insert 100 mg; supp 25, 100, 200, 500 mg, compounding kit 25, 50, 100, 200, 400 mg

### Implementation
**PO route**
- Do not crush, break, chew caps, give one dose in AM
- With food or milk to decrease GI symptoms
- Start progesterone 14 days after estrogen dose, if given concomitantly

**Vaginal route**
- Wait at least 6 hr after any vaginal treatment before using vaginal gel

**IM route**
- Store in dark area
- Give titrated dose; use lowest effective dosage; give oil sol deep in large muscle mass; rotate sites; use after warming to dissolve crystals
- Check for particulate matter and discoloration prior to injecting

## ADVERSE EFFECTS
**CNS:** *Dizziness, headache,* migraines, depression, *fatigue,* mood swings, dementia, drowsiness
**CV:** Hypotension, thrombophlebitis, edema, thromboembolism, stroke, pulmonary embolism, MI
**EENT:** Diplopia, retinal thrombosis
**GI:** *Nausea,* vomiting, anorexia, cramps, increased weight, cholestatic jaundice, *constipation,* abdominal pain
**GU:** Amenorrhea, cervical erosion, breakthrough bleeding, dysmenorrhea, vaginal candidiasis, nocturia, breast changes, *gynecomastia, testicular atrophy, impotence,* endometriosis, spontaneous abortion, breast pain, ectopic pregnancy
**INTEG:** Rash, urticaria, acne, hirsutism, alopecia, oily skin, seborrhea, purpura, melasma
**META:** Hyperglycemia
**SYST:** Angioedema, anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Breast milk |
| **Half-life** | Unknown |

### Pharmacodynamics

| | IM | RECT | VAG |
|---|---|---|---|
| **Onset** | Unknown | Unknown | Unknown |
| **Peak** | Unknown | Unknown | Unknown |
| **Duration** | 24 hr | 24 hr | 24 hr |

## INTERACTIONS
### Drug classifications
Barbiturates, phenytoins: decreased progesterone effect
CYP3A4 inhibitors (cimetidine, clarithromycin, danazol, diltiazem, erythromycin, fluconazole, itraconazole, ketoconazole, troleandomycin, verapamil, voriconazole): increased progesterone effect

### Drug/lab test
Increased: alkaline phosphatase, nitrogen (urine), pregnanediol, amino acids, factors VII, VIII, IX, X
Decreased: GTT, HDL

## NURSING CONSIDERATIONS
### Assessment
- Monitor B/P at beginning of treatment and periodically; check weight daily; notify prescriber of weekly weight gain >5 lb
- Monitor I&O ratio: be alert for decreasing urinary output, increasing edema, hypertension
- Assess liver function tests: ALT, AST, bilirubin periodically during long-term therapy
- Assess edema, hypertension, cardiac symptoms, jaundice
- Assess mental status: affect, mood, behavioral changes, depression
- Assess for hypercalcemia
- Assess cervical cytology
- Conduct breast exam
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

P

### Patient/family education

- Teach patient to avoid activities requiring mental alertness until effects are realized; can cause dizziness
- Teach patient to report breast lumps, vaginal bleeding, edema, jaundice, dark urine, clay-colored stools, dyspnea, headache, blurred vision, abdominal pain, numbness or stiffness in legs, chest pain
- Teach patient to report suspected pregnancy
- Teach patient to avoid gel with other vaginal products; if to be used together, to separate by 6 hr; for vaginal route, teach patient proper insertion technique

### Evaluation

**Positive therapeutic outcome**

- Decreased abnormal uterine bleeding
- Absence of amenorrhea
- Prevented pregnancy

**⚠ HIGH ALERT**

## promethazine (Rx)

(proe-meth'a-zeen)

**Histamil, Phenergan, Promethagan**

*Func. class.:* Antihistamine, $H_1$-receptor antagonist; antiemetic; sedative/hypnotic

*Chem. class.:* Phenothiazine derivative

**ACTION:** Acts on blood vessels, GI, respiratory system by competing with histamine for $H_1$-receptor site; decreases allergic response by blocking histamine

**Therapeutic outcome:** Absence of allergy symptoms and rhinitis, absence of nausea/vomiting, sedation

**USES:** Motion sickness, rhinitis, allergy symptoms, sedation, nausea, preoperative and postoperative sedation

## CONTRAINDICATIONS

Hypersensitivity to $H_1$-receptor antagonist, agranulocytosis, bone marrow suppression, breastfeeding, coma, jaundice, Reye's syndrome

**BLACK BOX WARNING:** Infants, intraarterial/SUBCUT use, neonates, children, extravasation

**Precautions:** Pregnancy, renal/cardiac/hepatic disease, asthma, seizure disorder, prostatic hypertrophy, bladder obstruction, glaucoma, COPD, GI obstruction, ileus, CNS depression, diabetes, sleep apnea, urinary retention

**BLACK BOX WARNING: IV** use, tissue necrosis

## DOSAGE AND ROUTES

### Nausea/vomiting

**Adult:** PO/IM/**IV**/RECT 12.5-25 mg; q4-6hr prn
**Child >2 yr:** PO/IM/**IV**/RECT 0.25-0.5 mg/kg q4-6hr prn

### Motion sickness

**Adult:** PO 25 mg bid; give 30-60 min before departure and q8-12hr prn
**Child >2 yr:** PO/IM/RECT 12.5-25 mg bid; give 30-60 min before departure and q8-12hr prn

### Allergy/rhinitis (unlabeled)

**Adult:** PO 12.5 mg qid, or 25 mg at bedtime
**Child ≥2 yr:** PO 6.25-12.5 mg tid or 25 mg at bedtime

### Sedation

**Adult:** PO/IM 25-50 mg at bedtime
**Child ≥2 yr:** PO/IM/RECT 12.5-25 mg at bedtime

### Sedation (preoperative/postoperative)

**Adult:** PO/IM/**IV** 25-50 mg
**Child ≥2 yr:** PO/IM/**IV** 0.5-1.1 mg/kg

**Available forms:** Tabs 12.5, 25, 50 mg; supp 12.5, 25, 50 mg; inj 25, 50 mg/ml

### Implementation

**PO route**

- With meals for GI symptoms; absorption may slightly decrease
- When used for motion sickness, 30 min-1 hr before travel

**IM route**

- IM inj in deep in large muscle; rotate site

**Direct IV route**

**BLACK BOX WARNING:** Check for extravasation: burning, pain, swelling at **IV** site, can cause tissue necrosis

- Do not use if precipitate is present
- Rapid administration may cause transient decrease in B/P
- After diluting each 25-50 mg/9 ml of NaCl for inj; give 25 mg or less/2 min

**Y-site compatibilities:** Alfentanil, amifostine, amikacin, aminocaproic acid, amsacrine, anidulafungin, ascorbic acid, atenolol, atracurium, atropine, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, cladribine, codeine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexmedetomidine, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doxacurium,

DOXOrubicin, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, epoetin, eptifibatide, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, gemcitabine, gentamicin, glycopyrrolate, granisetron, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, insulin (regular), irinotecan, isoproterenol, labetalol, levofloxacin, lidocaine, linezolid, LORazepam, LR, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, metaraminol, methoxamine, methyldopate, metoclopramide, metoprolol, metroNIDAZOLE, miconazole, midazolam, milrinone, mitoXANtrone, morphine, mycophenolate, nalbuphine, naloxone, netilmicin, nitroglycerin, norepinephrine, octreotide, ondansetron, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, PEMEtrexed, pentamidine, pentazocine, phenylephrine, polymyxin B, procainamide, prochlorperazine, propranolol, protamine, pyridoxine, quiNIDine, quinupristin-dalfopristin, ranitidine, remifentanil, Ringer's, ritodrine, riTUXimab, rocuronium, sargramostim, sodium acetate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, tigecycline, tirofiban, TNA, tobramycin, tolazoline, trastuzumab, trimetaphan, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, voriconazole

## ADVERSE EFFECTS

**CNS:** *Dizziness, drowsiness,* poor coordination, fatigue, anxiety, euphoria, confusion, paresthesia, neuritis, EPS, neuroleptic malignant syndrome

**CV:** Hyper/hypotension, palpitations, tachycardia

**EENT:** Blurred vision, dilated pupils, tinnitus, nasal stuffiness, dry nose, throat, mouth, photosensitivity

**GI:** *Constipation,* dry mouth, nausea, vomiting, anorexia, diarrhea

**GU:** *Retention,* dysuria, frequency

**HEMA:** Thrombocytopenia, agranulocytosis, hemolytic anemia

**INTEG:** Rash, urticaria, photosensitivity

**RESP:** Increased thick secretions, wheezing, chest tightness, apnea in pediatric patients

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO, IM); erratically absorbed (RECT) |
| **Distribution** | Widely distributed; crosses the blood-brain barrier, placenta |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | Unknown |

### Pharmacodynamics

| | PO/IM/RECT | IV |
|---|---|---|
| **Onset** | 20 min | 3-5 min |
| **Peak** | Unknown | Unknown |
| **Duration** | 4-12 hr | 4-6 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression

Heparin: decreased oral anticoagulants effect

### Drug classifications

Antidepressants (tricyclics), barbiturates, CNS depressants, opiates, sedative/hypnotics: increased CNS depression

MAOIs: increased promethazine effect

### Drug/lab test

False negative: skin allergy tests (discontinue antihistamines 3 days before testing)

False positive: urine pregnancy test

Interference: blood grouping (ABO), GTT

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Child:** Not to be used in children <2 yr: fatal respiratory depression may occur; use cautiously in children >2 yr: seizures, paradoxical CNS stimulation may occur

- **Neuroleptic malignant syndrome:** assess for fever, confusion, diaphoresis, rigid muscles, elevated CPK, encephalopathy, discontinue product, notify prescriber
- Assess respiratory status: rate, rhythm, increase in bronchial secretions, wheezing, chest tightness; provide fluids to 2 L/day to decrease secretion thickness
- Monitor I&O ratio: be alert for urinary retention, frequency, dysuria, especially geriatric; product should be discontinued if these occur
- Monitor CBC during long-term therapy; blood dyscrasias may occur but are rare
- Monitor cardiac status: VS, palpitations, increased pulse, hypo/hypertension
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed

### Patient/family education

- Inform patient that a false-negative result may occur with skin testing; these procedures should not be scheduled until 3 days after discontinuing use
- Advise patient to take 30 min before departure to prevent motion sickness
- Caution patient to avoid hazardous activities, activities requiring alertness, since dizziness may

P

occur; instruct patient to request assistance with ambulation
• Advise patient to avoid alcohol, other depressants; serious CNS depression may occur
• Teach patient all aspects of product use; to notify prescriber if confusion, sedation, hypotension, jaundice, fever occur; to avoid driving and other hazardous activity if drowsiness occurs
• Advise patient to take 1 hr before or 2 hr after meals to facilitate absorption
• Caution patient not to exceed recommended dosage; dysrhythmias may occur
• Inform patient hard candy, gum, frequent rinsing of mouth may be used for dryness
• Advise that product may reduce sweating (heat stroke)

### Evaluation

**Positive therapeutic outcome**
• Absence of motion sickness
• Absence of nausea, vomiting

**⚠ HIGH ALERT**

## propafenone (Rx)

(pro-paff'e-nown)
**Rythmol, Rythmol SR**
*Func. class.:* Antidysrhythmic (Class IC)

**ACTION:** Slows conduction velocity; reduces membrane responsiveness; inhibits automaticity; increases ratio of effective refractory period to action potential duration; β-blocking activity

**Therapeutic outcome:** Absence of arrhythmias

**USES:** Atrial fibrillation (single dose), sustained ventricular tachycardia, paroxysmal supraventricular tachycardia (PSVT) prophylaxis, supraventricular dysrhythmias

## CONTRAINDICATIONS

2nd-, 3rd-degree AV block, right bundle branch block, cardiogenic shock, hypersensitivity, bradycardia, uncontrolled HF, sick sinus syndrome, marked hypotension, bronchospastic disorders, electrolyte imbalance, Brugada syndrome

**Precautions:** Pregnancy, breastfeeding, children, geriatric, HF, hypo/hyperkalemia, nonallergic bronchospasm, renal/hepatic disease, hematologic disorders, myasthenia gravis, COPD, cardiac arrhythmias, QT prolongation, torsades de pointes

**BLACK BOX WARNING:** Recent MI

## DOSAGE AND ROUTES

### PSVT

**Adult:** PO 150 mg q8hr; allow a 3-4 day interval before increasing dose, max 900 mg/day

### Atrial fibrillation

**Adult:** PO 450 or 600 mg as a single dose; SR 225 mg q12hr, may increase to 325 mg q12hr, max 425 mg q12hr

**Available forms:** Tabs 150, 225, 300 mg, SR cap 225, 325, 425 mg

### Implementation

• Begin treatment in hospital
• Remove other antiarrhythmics before starting propafenone
• Adjust dosage q3-4day, no sooner

## ADVERSE EFFECTS

**CNS:** Headache, dizziness, abnormal dreams, syncope, confusion, seizures, insomnia, tremor, anxiety, fatigue
**CV:** Supraventricular dysrhythmia, ventricular dysrhythmia, bradycardia, prodysrhythmia, palpitations, AV block, intraventricular conduction delay, AV dissociation, hypotension, chest pain, asystole
**EENT:** Blurred vision, altered taste, tinnitus
**GI:** *Nausea, vomiting*, constipation, dyspepsia, cholestasis, abnormal hepatic studies, dry mouth, diarrhea, anorexia
**HEMA:** Leukopenia, agranulocytosis, granulocytopenia, thrombocytopenia, anemia, bruising
**INTEG:** Rash
**RESP:** Dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely, crosses placenta |
| **Metabolism** | Rapid, liver, CYP1A2, CYP2D6, CYP3A4 |
| **Excretion** | Kidneys |
| **Half-life** | 2-32 hr, poor metabolizers 10-32 hr |

### Pharmacodynamics (antiarrhythmic)

| | |
|---|---|
| **Onset** | Hours to several days |
| **Peak** | 4-5 days |
| **Duration** | Several hr |

## INTERACTIONS

### Individual products

Arsenic trioxide, chloroquine, clarithromycin, droperidol, erythromycin, haloperidol, levomethadyl, methadone, pentamidine, chlorproMAZINE, mesoridazine, thioridazine: increased QT prolongation
Cimetidine, quiNIDine, rifampin: decreased propafenone effect
CycloSPORINE, digoxin: increased serum levels
Metoprolol, propranolol: increased β-blocker effect
Warfarin: increased anticoagulation

### Drug classifications
Local anesthetics: increased CNS effects
CYP1A2, CYP2D6, CYP3A4 inhibitors (protease inhibitors, quiNINE, PARoxetine, saquinavir, erythromycin, azole antifungals, sertraline, tricyclics): increased propafenone effects

### Drug/food
Grapefruit juice: increased propafenone effect

### Drug/herb
St. John's wort: decreased propafenone effect

### Drug/lab test
Increased: CPK, Hct, Hgb
Decrease: WBC, platelets

## NURSING CONSIDERATIONS
### Assessment
- Monitor GI status: bowel pattern, number of stools
- **Assess cardiac status:** rate, rhythm, quality; ECG or Holter monitor prior to, during therapy; watch for PR, QT prolongation
- Monitor chest x-ray film, pulmonary function test during treatment
- Monitor I&O ratio; check for decreasing output; daily weight
- Monitor B/P for fluctuations
- Assess lung fields; bilateral crackles, dyspnea, peripheral edema, weight gain, jugular venous distention may occur in HF patient
- **Assess toxicity:** fine tremors, dizziness, hypotension, drowsiness, abnormal heart rate
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed, excreted in breast milk

### Patient/family education
- Advise patient to avoid hazardous activities until response is known
- Advise patient to report fever, chills, sore throat, bleeding, shortness of breath, chest pain, palpitations, blurred vision
- Advise patient to take medication with food
- Advise patient to carry emergency ID identifying medication and prescriber
- Instruct patient not to use with grapefruit juice or St. John's wort
- **Pregnancy:** Notify prescriber if pregnancy is planned or suspected, do not breastfeed

### Evaluation
**Positive therapeutic outcome**
- Absence of dysrhythmias

## TREATMENT OF OVERDOSE:
$O_2$, artificial ventilation, defibrillation ECG; administer DOPamine for circulatory depression, diazepam or thiopental for seizures, isoproterenol

## proparacaine ophthalmic
*See Appendix B*

**⚠ HIGH ALERT**

## propofol (Rx)
(pro′poh-fole)
**Diprivan**
*Func. class.:* Hypnotic

**Do not confuse:** Diprivan/Diflucan/Ditropan

**ACTION:** Produces dose-dependent CNS depression by activation of GABA receptor

**Therapeutic outcome:** Induction of anesthesia

**USES:** Induction or maintenance of anesthesia as part of balanced anesthetic technique; sedation in mechanically ventilated patients

## CONTRAINDICATIONS
Hypersensitivity to product or soybean oil, egg, benzyl alcohol (some products)

**Precautions:** Pregnancy, breastfeeding, children, geriatric, respiratory depression, severe respiratory disorders, cardiac dysrhythmias, labor and delivery, renal disease, hyperlipidemia

## DOSAGE AND ROUTES
### Anesthesia
**Adult <55 yr and ASA I/II IV (Diprivan or generic): IV** 40 mg q10sec until induction onset; maintenance: 100-200 mcg/kg/min or **IV BOL** 20-50 mg prn, allow 3-5 min between adjustments
**Child ≥3 yr or ASA I or II: IV Induction:** 2.5-3.5 mg/kg over 20-30 sec when not premedicated or lightly premedicated
**Child 2 mo-16 yr maintenance: IV** 125-300 mcg/kg/min, lower dose for ASA III or IV

### ICU sedation
**Adult: IV** 5 mcg/kg/min over 5 min; may increase by 5-10 mcg/kg/min over 5-10 min until desired response (Diprivan or generic)

**Available forms:** Inj 10 mg/ml in 20 ml ampule, vials, syringes

### Implementation
**IV route**
- Shake well before use; dilution is not necessary but if diluted, use only $D_5W$ to ≥2 mg/ml; give over 3-5 min, titrate to needed level of sedation; use only glass containers when mixing, not stable in plastic; use aseptic technique when transferring from original container

• Only with resuscitative equipment available, only by qualified persons trained in anesthesia

**Y-site compatibilities:** Acyclovir, alfentanil, aminophylline, ampicillin, aztreonam, bumetanide, buprenorphine, butorphanol, calcium gluconate, CARBOplatin, ceFAZolin, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, ceftizoxime, cefTRIAXone, cefuroxime, chlorproMAZINE, cimetidine, CISplatin, clindamycin, cyclophosphamide, cycloSPORINE, cytarabine, dexamethasone, diphenhydrAMINE, DOBUTamine, DOPamine, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, esmolol, famotidine, fentaNYL, fluconazole, fluorouracil, furosemide, ganciclovir, glycopyrrolate, granisetron, haloperidol, heparin, hydrocortisone, HYDROmorphone, hydrOXYzine, ifosfamide, imipenem/cilastatin, inamrinone, regular insulin, isoproterenol, ketamine, labetalol, levorphanol, lidocaine, LORazepam, magnesium sulfate, mannitol, meperidine, mezlocillin, miconazole, morphine, nafcillin, nalbuphine, naloxone, nitroglycerin, norepinephrine, ofloxacin, PACLitaxel, PENTobarbital, PHENobarbital, piperacillin, potassium chloride, prochlorperazine, propranolol, ranitidine, scopolamine, sodium bicarbonate, sodium nitroprusside, succinylcholine, SUFentanil, thiopental, ticarcillin, ticarcillin/clavulanate, vecuronium, verapamil

**Solution compatibilities:** (If given together via Y-site) $D_5W$, $D_5LR$, LR, $D_5/0.45\%$ NaCl, $D_5/0.2\%$ NaCl

## ADVERSE EFFECTS

**CNS:** Involuntary movement, headache, jerking, fever, dizziness, shivering, tremor, confusion, somnolence, paresthesia, agitation, abnormal dreams, euphoria, fatigue, increased ICP, impaired cerebral flow, seizures

**CV:** *Bradycardia, hypotension,* hypertension, PVC, PAC, tachycardia, abnormal ECG, ST segment depression, asystole, bradydysrhythmias

**EENT:** Blurred vision, tinnitus, eye pain, strange taste, diplopia

**GI:** *Nausea, vomiting, abdominal cramping,* dry mouth, swallowing, hypersalivation, pancreatitis

**GU:** Urine retention, green urine, cloudy urine, oliguria

**INTEG:** *Flushing, phlebitis, hives, burning/stinging at inj site,* rash, pain of extremities

**MS:** Myalgia

**RESP:** Apnea, *cough, hiccups*, dyspnea, hypoventilation, sneezing, wheezing, tachypnea, hypoxia, respiratory acidosis

**SYST:** Propofol infusion syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Completely absorbed |
| **Distribution** | Rapid |
| **Metabolism** | Liver, conjugation to active metabolites; 95%-99% protein binding |
| **Excretion** | Urine |
| **Half-life** | 3-12 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 15-30 sec |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression

### Drug classifications

Antipsychotics, CNS depressants (sedative-hypnotics, opioid analgesics), inhalational anesthetics, skeletal muscle relaxants: increased CNS depression

MAOIs: do not use within 10 days

### Drug/herb

St. John's wort: increased propofol effect

## NURSING CONSIDERATIONS

### Assessment

- Assess inj site: phlebitis, burning, stinging
- **Monitor ECG for changes:** PVC, PAC, ST segment changes; monitor VS
- Assess CNS changes: movement, jerking, tremors, dizziness, LOC, pupil reaction
- Avoid general anesthetic use in child <3 yr, may negatively affect the brain
- Assess allergic reactions: hives
- **Assess respiratory dysfunction:** respiratory depression, character, rate, rhythm; notify prescriber if respirations are <10/min
- **Propofol infusion syndrome:** assess for rhabdomyolysis, renal failure, hyperkalemia, metabolic acidosis, cardiac dysrhythmias, heart failure, usually between 35 and 93 hr after inf began, at >5 mg/kg/hr for >58 hr
- **Pregnancy/breastfeeding:** Use only if clearly needed, avoid breastfeeding, excreted in breast milk

### Patient/family education

- Teach patient that this medication will cause dizziness, drowsiness, sedation; to avoid hazardous activities until drug effect wears off, may cause burning sensation during administration

## Evaluation

**Positive therapeutic outcome**
- Induction of anesthesia

## TREATMENT OF OVERDOSE:
Discontinue product; administer vasopressor agents or anticholinergics, artificial ventilation

**⚠ HIGH ALERT**

## propranolol (Rx)
(proe-pran′oh-lole)
**Hemanegeol, Inderal XL Inderal, Inderal LA, InnoPran XL**
*Func. class.:* Antihypertensive, antianginal, antidysrhythmic (class III)
*Chem. class.:* β-Adrenergic blocker

**Do not confuse:** Inderal/Adderall, propranolol/Pravachol

**ACTION:** Nonselective β-blocker with negative inotropic, chronotropic, dromotropic properties

**Therapeutic outcome:** Decreased B/P, heart rate

**USES:** Chronic stable angina pectoris, hypertension, supraventricular dysrhythmias, migraine prophylaxis, pheochromocytoma, cyanotic spells related to hypertrophic subaortic stenosis, essential tremor, acute MI

**Unlabeled uses:** Prevention of variceal bleeding caused by portal hypertension, akathisia induced by antipsychotics, lithium-induced tremor

## CONTRAINDICATIONS
Hypersensitivity to this product, cardiogenic shock, AV heart block, bronchospastic disease, sinus bradycardia, bronchospasm, asthma

**Precautions:** Pregnancy, breastfeeding, children, diabetes mellitus, renal/hepatic disease, hyperthyroidism, COPD, myasthenia gravis, peripheral vascular disease, hypotension, cardiac failure, Raynaud's disease, sick sinus syndrome, vasospastic angina, smoking, Wolff-Parkinson-White syndrome, thyrotoxicosis

**BLACK BOX WARNING:** Abrupt discontinuation

## DOSAGE AND ROUTES
### Dysrhythmias
**Adult:** PO 10-30 mg tid-qid; **IV** BOL 1-3 mg given 1 mg/min; may repeat in 2 min; may repeat q4hr thereafter
**Child:** PO 1 mg/kg/day divided in 2 doses, **IV** 0.01-0.1 mg/kg over 5 min

### Hypertension
**Adult:** PO 40 mg bid or 80 mg/day (EXT REL) initially; usual dosage 120-240 mg/day bid-tid or 120-160 mg/day (EXT REL)
**Child:** PO 0.5-1 mg/kg/day divided q6-12hr

### Angina
**Adult:** PO 10-20 mg bid-qid, increase at 3-7 day intervals up to 160-320 mg/day, or ext rel 80 mg/day, increase at 3-7 day intervals up to 160-320 mg/day

### MI prophylaxis
**Adult:** PO 180-240 mg/day tid-qid starting 5 days to 2 wk after MI

### Pheochromocytoma
**Adult:** PO 60 mg/day × 3 days preoperatively in divided doses or 30 mg/day in divided doses (inoperable tumor)

### Migraine
**Adult:** PO 80 mg/day (EXT REL) or in divided doses; may increase to 160-240 mg/day in divided doses
**Child:** PO 0.6-1.5 mg/kg/day divided q8hr
**Child ≤35 kg (unlabeled):** PO 10-20 mg tid

### Essential tremor
**Adult:** PO 40 mg bid; usual dosage 120 mg/day

**Available forms:** Ext rel caps 60, 80, 120, 160 mg; tabs 10, 20, 40, 60, 80, 90 mg; inj 1 mg/ml; oral sol 4 mg, 8 mg/ml

### Implementation
**PO route**
- Do not break, crush, chew, or open ext rel cap
- Do not use ext rel cap for essential tremor, MI, cardiac dysrhythmias; do not use InnoPran XL in hypertropic subaortic stenosis, migraine, angina pectoris
- Ext rel caps should be taken daily; InnoPran XL should be taken at bedtime
- May mix oral sol with liquid or semisolid food; rinse container to get entire dose
- Give with 8 oz water with food; food enhances bioavailability
- Do not give with aluminum-containing antacid; may decrease GI absorption

**Direct IV route**
- IV undiluted or diluted 10 ml $D_5W$ for inj; give 1 mg or less/min

**Intermittent IV infusion route**
- May be diluted in 50 ml NaCl and run 1 mg over 10-15 min

**Y-site compatibilities:** Acyclovir, alfentanil, alteplase, amikacin, aminocaproic acid, aminophylline, anidulafungin, ascorbic acid, atracurium, atropine, azaTHIOprine, aztreonam,

benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, cefamandole, ceFAZolin, cefmetazole, cefonicid, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, cephalothin, cephapirin, chloramphenicol, chlorproMAZINE, cimetidine, CISplatin, clindamycin, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doxacurium, DOXOrubicin, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, epoetin alfa, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, folic acid, furosemide, ganciclovir, gatifloxacin, gemcitabine, gemtuzumab, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, ifosfamide, imipenem-cilastatin, inamrinone, irinotecan, isoproterenol, ketorolac, labetalol, levofloxacin, lidocaine, linezolid, LORazepam, magnesium, mannitol, mechlorethamine, meperidine, metaraminol, methicillin, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, mezlocillin, miconazole, midazolam, milrinone, minocycline, mitoXANtrone, morphine, moxalactam, multiple vitamins, mycophenolate, nafcillin, nalbuphine, naloxone, nesiritide, netilmicin, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, palonosetron, pamidronate, pancuronium, papaverine, PEMEtrexed, penicillin G potassium/sodium, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phenylephrine, phytonadione, piperacillin, polymyxin B, potassium chloride, procainamide, prochlorperazine, promethazine, propofol, protamine, pyridoxine, quiNIDine, quinupristin-dalfopristin, ranitidine, ritodrine, rocuronium, sodium acetate/bicarbonate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin-clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, vitamin B complex/C, voriconazole, zoledronic acid

## ADVERSE EFFECTS

**CNS:** Depression, hallucinations, *dizziness, fatigue,* lethargy, paresthesia, bizarre dreams, disorientation

**CV:** Bradycardia, *hypotension,* HF, palpitations, AV block, peripheral vascular insufficiency, vasodilatation, pulmonary edema, dysrhythmias, cold extremities

**EENT:** Sore throat, laryngospasm, blurred vision, dry eyes

**GI:** Nausea, vomiting, diarrhea, colitis, constipation, cramps, dry mouth, hepatomegaly, gastric pain, acute pancreatitis

**GU:** Impotence, decreased libido, UTIs

**HEMA:** Agranulocytosis, thrombocytopenia

**INTEG:** Rash, pruritus, fever, Stevens-Johnson syndrome, toxic epidermal necrolysis

**META:** Hyperglycemia, hypoglycemia

**MISC:** Facial swelling, weight change, Raynaud's phenomenon

**MS:** Joint pain, arthralgia, muscle cramps, pain

**RESP:** Dyspnea, respiratory dysfunction, bronchospasm, cough

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO); slowly absorbed (ext rel); completely absorbed (**IV**) |
| **Distribution** | Widely distributed, crosses blood-brain barrier, protein binding 90% |
| **Metabolism** | Liver, extensively by CYP2D6 enzyme system, ☠ 7% of population are poor metabolizers |
| **Excretion** | Kidneys |
| **Half-life** | 3-8 hr; ext rel 8-11 hr |

### Pharmacodynamics

| | PO | PO-EXT REL | IV |
|---|---|---|---|
| **Onset** | ½ hr | Unknown | Rapid |
| **Peak** | 1-1½ hr | 6 hr | 1 min |
| **Duration** | 6-12 hr | 24 hr | 2-4 hr |

## INTERACTIONS

### Individual drugs

Cimetidine: increased β-blocking effect

Disopyramide: increased negative inotropic effects

Haloperidol, prazosin, quiNIDine: increased hypotension

Propafenone: increased propranolol levels

Smoking: decreased propranolol levels

### Drug classifications

Barbiturates: decreased β-blocking effect

Calcium channel blockers, neuromuscular blockers: increased effects

Phenothiazines: increased toxicity

### Drug/herb

Hawthorn: increased antihypertensive effect
Avoid use with feverfew, ma huang: decreased antihypertensive effect

### Drug/lab test

Increased: serum potassium, serum uric acid, AST, ALT, alkaline phosphatase, LDH
Decreased: blood glucose
Interference: glaucoma testing

## NURSING CONSIDERATIONS

### Assessment

- Monitor B/P during beginning treatment, periodically thereafter; pulse q4hr; note rate, rhythm, quality; check apical/radial pulse before administration; notify prescriber of any significant changes (pulse <50 bpm or systolic B/P <90 mm Hg)

**BLACK BOX WARNING:** Abrupt withdrawal: taper over 1-2 weeks; do not discontinue abruptly; dysrhythmias, angina, myocardial ischemia, or MI may recur

- Monitor ECG continuously if using an antidysrhythmic IV, PCWP (pulmonary capillary wedge pressure), CVP (central venous pressure)
- Assess for edema in feet, legs daily; monitor; check for jugular vein distention, crackles bilaterally; dyspnea (HF)
- Monitor skin turgor, dryness of mucous membranes for hydration status, especially geriatric
- Assess for headache, light-headedness, decreased B/P; may indicate need for decreased dose; may aggravate symptoms of arterial insufficiency
- Monitor hepatic enzymes: AST, ALT, bilirubin; blood glucose (diabetes mellitus)
- Angina pain: Assess duration, time started, activity being performed, character
- Assess for tolerance with long-term use
- Fluid overload: Monitor weight daily; report gain of >5 lb
- Monitor I&O ratio, CCr if kidney damage is diagnosed; fatigue, weight gain, jugular distention, dyspnea, peripheral edema, crackles
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding

### Patient/family education

- Teach patient not to discontinue product abruptly (life-threatening dysrhythmias, exacerbation of angina, MI); to take at same time of day either with or without food consistently; taper over at least a few wk
- Teach patient not to use OTC products containing α-adrenergic stimulants (such as nasal decongestants, cold preparations); to avoid alcohol, smoking and to limit sodium intake as prescribed; blood glucose (diabetes mellitus)
- Teach patient how to take pulse and B/P at home; advise when to notify prescriber
- Instruct patient to comply with weight control, dietary adjustments, modified exercise program
- Instruct patient to carry/wear emergency ID to identify product being taken, allergies; tell patient product controls symptoms but does not cure
- Caution patient to avoid hazardous activities if dizziness, drowsiness are present
- **Teach patient to report symptoms of HF:** difficulty breathing, especially on exertion or when lying down, night cough, swelling of extremities or bradycardia, dizziness, confusion, depression, fever
- Advise patient that sensitivity to cold may occur
- Teach patient to monitor blood glucose; may mask symptoms of hypoglycemia
- Teach patient how to take pulse, B/P; withhold if <50 bpm or systolic B/P <90 mm Hg

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P in hypertension (after 1-2 wk)
- Decreased tremors
- Absence of dysrhythmias
- Decreased migraine headaches

## TREATMENT OF OVERDOSE:

Lavage, **IV** atropine for bradycardia, **IV** theophylline for bronchospasm, digoxin, $O_2$, diuretic for cardiac failure, hemodialysis, **IV** glucose for hyperglycemia, **IV** diazepam (or phenytoin) for seizures

**⚠ HIGH ALERT**

## propylthiouracil (Rx)

(proe-pill-thye-oh-yoor'a-sill)
**Propyl-Thyracil** 🍁
*Func. class.:* Thyroid hormone antagonist (antithyroid)
*Chem. class.:* Thioamide

**ACTION:** Blocks synthesis peripherally of $T_3$, $T_4$, inhibits organification of iodine

**Therapeutic outcome:** Decreased $T_3$, $T_4$ levels, hyperthyroid symptoms

**USES:** Preparation for thyroidectomy, thyrotoxic crisis, hyperthyroidism, thyroid storm

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity, agranulocytosis, hepatitis, jaundice

**Precautions:** Infection, bone marrow depression, hepatic disease, fever

**BLACK BOX WARNING:** Hepatic disease

## DOSAGE AND ROUTES

### Thyrotoxic crisis

**Adult and child:** PO 200-400 mg q4h for 1st 24 hr

### Preparation for thyroidectomy

**Adult:** PO 600-1200 mg/day
**Child:** PO 10 mg/kg/day in divided doses

### Hyperthyroidism

**Adult:** PO 100 mg tid increasing to 300 mg q8hr if condition is severe; continue to euthyroid state, then 100 mg daily-tid
**Child >6 yr:** PO 50 mg/day divided doses q8hr, titrate based on TSH/free $T_4$ levels
**Neonate (unlabeled):** PO 10 mg/kg/day in divided doses

### Available forms: Tabs 50 mg

### Implementation

- Give with meals to decrease GI upset
- Give at same time each day to maintain product level
- Give lowest dosage that relieves symptoms
- Store in light-resistant container
- Increase fluids to 3-4 L/day, unless contraindicated

## ADVERSE EFFECTS

**CNS:** *Drowsiness, headache, vertigo, fever,* paresthesias, neuritis
**GI:** *Nausea, diarrhea, vomiting,* jaundice, hepatitis, loss of taste, liver failure, death
**GU:** Nephritis
**HEMA:** Agranulocytosis, leukopenia, thrombocytopenia, hypothrombinemia, lymphadenopathy, bleeding, vasculitis, periarteritis
**INTEG:** *Rash, urticaria, pruritus, alopecia, hyperpigmentation,* lupuslike syndrome
**MS:** Myalgia, arthralgia, nocturnal muscle cramps, osteoporosis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Crosses placenta, concentration in thyroid gland |
| **Metabolism** | Liver |
| **Excretion** | Urine, bile, breast milk |
| **Half-life** | 1-2 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 30-40 min |
| **Peak** | Unknown |
| **Duration** | 2-4 hr |

## INTERACTIONS

### Individual drugs

Heparin: decreased anticoagulant effect
Lithium: increased antithyroid effect
Potassium/sodium iodide: increased effects
Radiation: increased bone marrow depression

### Drug classifications

Anticoagulants (oral): decreased anticoagulant effect
Antineoplastics: increased bone marrow depression
Phenothiazines: increased agranulocytosis

### Drug/lab test

Increased: pro-time, AST, ALT, alkaline phosphatase

## NURSING CONSIDERATIONS

### Assessment

- Monitor pulse, B/P, temp; I&O ratio; check for edema (puffy hands, feet, periorbits); indicates hypothyroidism
- Check weight daily with same clothing, scale, time of day
- Hyperthyroidism: weight loss, nervousness, insomnia, fever, diaphoresis, tremors
- Hypothyroidism: constipation, dry skin, weakness, headache
- Monitor $T_3$, $T_4$, which are increased; check serum TSH, which is decreased; assess free thyroxine index, which is increased if dosage is too low; discontinue product 3-4 wk before radioactive iodine uptake test
- **Blood dyscrasias:** Monitor CBC with differential; leukopenia, thrombocytopenia, agranulocytosis, monitor periodically; agranulocytosis may develop in first 2 mo of treatment, discontinue treatment
- **Overdose:** Assess for peripheral edema, heat intolerance, diaphoresis, palpitations, dysrhythmias, severe tachycardia, increased temp, delirium, CNS irritability
- **Hypersensitivity:** Assess for rash, enlarged cervical lymph nodes; product may have to be discontinued
- **Hypoprothrombinemia:** assess for bleeding, petechiae, ecchymosis
- **Bone marrow depression:** assess for sore throat, fever, fatigue

**BLACK BOX WARNING: Hepatotoxicity:** monitor LFTs before and during treatment; jaundice, nausea, vomiting, abdominal pain, anorexia, diarrhea, fatigue

- Monitor clinical response: after 3 wk should include increased weight, decreased pulse, decreased $T_4$
- **Pregnancy/benefits:** Do not use in pregnancy, breastfeeding

### Patient/family education

- product appears in breast milk
- Teach patient to take pulse daily and to keep graph of weight, pulse, mood
- Advise patient to report redness, swelling, sore throat, mouth lesions, which indicate blood dyscrasias (yellow skin/eyes, clay-colored stools, dark urine)
- Caution patient to avoid OTC products that contain iodine; that seafood, other iodine-containing foods may be restricted by prescriber
- Teach patient that response may take several mo if thyroid is large
- **Teach patient symptoms/signs of overdose:** periorbital edema, cold intolerance, mental depression; notify prescriber at once
- **Pregnancy:** Notify prescriber immediately if pregnancy is planned or suspected, do not breastfeed
- Teach patient symptoms of inadequate dose: tachycardia, diarrhea, fever, irritability; prescriber should be notified to adjust dosage
- Teach patient to take medication exactly as prescribed, not to skip or double doses; missed doses should be taken when remembered up to 1 hr before next dose
- Instruct patient to carry/wear emergency identification indicating medication taken and condition being treated

### Evaluation

**Positive therapeutic outcome**

- Weight gain
- Decreased pulse
- Decreased $T_4$
- Decreased B/P

## protamine (Rx)

(proe′ta-meen)

*Func. class.:* Heparin antagonist

*Chem. class.:* Low-molecular-weight protein

**Do not confuse:** Protamine/Protonix

**ACTION:** Binds heparin, making it ineffective

**Therapeutic outcome:** Prevention of heparin overdose

**USES:** Heparin overdose; neutralizes heparin in procedures, hemorrhage

## CONTRAINDICATION

**BLACK BOX WARNING:** Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, fish allergy, diabetes, previous exposure to protamine, insulins, heparin rebound or bleeding

**BLACK BOX WARNING:** Requires a specialized care setting

## DOSAGE AND ROUTES

### Heparin overdose

**Adult and child: IV** 1 mg of protamine/100 units of heparin given; administer slowly over 1-3 min; max 50 mg/10 min

### Enoxaparin overdose

**Adult: IV** 1 mg of protamine/1 mg enoxaparin

### Dalteparin/tinzaparin overdose

**Adult: IV** 1 mg of protamine/100 anti-Xa unit

**Available forms:** Inj 10 mg/ml

### Implementation

**Direct IV route**

- After reconstituting 50 mg/5 ml sterile bacteriostatic water for inj, shake; give 20 mg or less over 1-3 min

**Y-site compatibilities:** Alfentanil, amikacin, aminophylline, ascorbic acid, atracurium, atropine, azaTHIOprine, aztreonam, benztropine, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, ceftazidime, chlorproMAZINE, cimetidine, clindamycin, cyanocobalamin, cycloSPORINE, digoxin, diphenhydrAMINE, DOBUTamine, DOPamine, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epoetin alfa, erythromycin, esmolol, famotidine, fentaNYL, fluconazole, ganciclovir, gentamicin, glycopyrrolate, hydrOXYzine, imipenem-cilastatin, inamrinone, iohexol, iopamidol, isoproterenol, labetalol, lidocaine, magnesium, mannitol, meperidine, metaraminol, methoxamine, methyldopate, metoclopramide, metoprolol, miconazole, midazolam, minocycline, morphine, multiple vitamins, nalbuphine, naloxone, netilmicin, nitroglycerin, nitroprusside, norepinephrine, ondansetron, oxytocin, papaverine, pentazocine, phenylephrine, polymyxin B, potassium chloride, procainamide, prochlorperazine, promethazine, propranolol, pyridoxine, quiNIDine, ranitidine, Ringer's, ritodrine, sodium bicarbonate, succinylcholine, SUFentanil, theophylline, thiamine, tobramycin, tolazoline, trimetaphan, urokinase, vancomycin, vasopressin, verapamil

## ADVERSE EFFECTS

**CV:** Hypotension, bradycardia, circulatory collapse, capillary leak
**GI:** Nausea, vomiting
**HEMA:** Bleeding
**INTEG:** *Rash,* dermatitis, urticaria
**RESP:** Dyspnea, pulmonary edema, severe respiratory distress, bronchospasm
**SYST:** Anaphylaxis, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Completely absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 5 min |
| **Peak** | Unknown |
| **Duration** | 2 hr |

## NURSING CONSIDERATIONS

### Assessment

- Monitor blood studies (Hct, platelets, occult blood stools) q3mo
- Monitor coagulation tests (aPTT, ACT) 15 min after dose, then in several hr
- Monitor VS, B/P, pulse q30min, plus 3 hr after dose

**BLACK BOX WARNING:** Assess for hypersensitivity: skin rash, urticaria, dermatitis, cough, wheezing, have emergency equipment nearby; men who have had a vasectomy may be more prone to hypersensitivity

- Assess for allergy to salmon; use with caution in these patients
- **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding

### Patient/family education

- Explain reason for medication and expected results; not to take if allergic to fish
- Caution patient to avoid contact activities that may result in bleeding
- Inform the patient about the purpose of product, expected result
- Teach patient to avoid activities where bleeding may occur such as shaving, use of hard bristle toothbrush, injections, rectal temperatures, until risk of bleeding has past

### Evaluation

**Positive therapeutic outcome**

- Reversal of heparin overdose

## pseudoephedrine (OTC)

(soo-doe-e-fed′rin)

**ElixSure Cold, Eltor, Nasofed, Sudafed, Sudafed 24 hour, Sudogest**

*Func. class.:* Adrenergic

*Chem. class.:* Substituted phenylethylamine

**Controlled Substance V**

**Do not confuse:** Sudafed/Sotalol

**ACTION:** Primary activity through α-adrenergic effects on respiratory mucosal membranes reducing congestion, hyperemia, edema; minimal bronchodilatation secondary to β-adrenergic effects

**Therapeutic outcome:** Decreased nasal congestion, swelling

**USES:** Nasal decongestant, otitis media adjunct, adjunct with antihistamines

## CONTRAINDICATIONS

Hypersensitivity to sympathomimetics, closed-angle glaucoma

**Precautions:** Pregnancy, breastfeeding, cardiac disorders, hyperthyroidism, diabetes mellitus, prostatic hypertrophy, hypertension

## DOSAGE AND ROUTES

**Adult and child >12 yr:** PO 60 mg q6hr; EXT REL 120 mg q12hr or 240 mg q24hr
**Geriatric:** PO 30-60 mg q6hr prn
**Child 6-12 yr:** PO 30 mg q6hr, max 120 mg/day
**Child 2-6 yr:** PO 15 mg q6hr, max 60 mg/day

**Available forms:** Ext rel caps 120, 240 mg; oral sol 15 mg, 30 mg/5 ml; tabs 30, 60 mg; ext rel tabs 120, 240 mg

### Implementation

- Swallow tab and ext rel cap whole; do not break, crush, or chew
- Avoid taking at or near bedtime if insomnia occurs
- Store at room temperature
- OTC preparations require an ID, tracked, Schedule V

## ADVERSE EFFECTS

**CNS:** *Tremors, anxiety,* stimulation, insomnia, headache, dizziness, hallucinations, seizures (geriatric)
**CV:** Palpitations, tachycardia, hypertension, chest pain, dysrhythmias, CV collapse
**EENT:** Dry nose, irritation of nose and throat
**GI:** *Anorexia, nausea, vomiting,* dry mouth, ischemic colitis
**GU:** Dysuria

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Enters CSF, crosses placenta |
| **Metabolism** | Liver, partially |
| **Excretion** | Kidneys, unchanged (75%); breast milk |
| **Half-life** | 7 hr |

### Pharmacodynamics

| | PO | PO-EXT REL |
|---|---|---|
| **Onset** | 15-30 min | 1 hr |
| **Peak** | Unknown | Unknown |
| **Duration** | 4-6 hr | 12 hr |

## INTERACTIONS

### Drug classifications

Antidepressants (tricyclics), MAOIs: hypertensive crisis, do not use together

Urinary acidifiers: decreased effect of pseudoephedrine

Urinary alkalizers, adrenergics, β-blockers, phenothiazines, tricyclics: increased effect of pseudoephedrine

## NURSING CONSIDERATIONS

### Assessment

- Monitor for nasal congestion; auscultate lung sounds; check for tenacious bronchial secretions; children with otitis media should be assessed for eustachian tube congestion
- Monitor B/P and pulse throughout treatment
- **Pregnancy/breastfeeding:** Avoid in pregnancy, cautious use in breastfeeding

### Patient/family education

- Teach patient reason for product administration and expected results
- Instruct patient not to use continuously, or more than recommended dose; rebound congestion may occur
- Advise patient to check with prescriber before using other products, as product interactions may occur
- Advise patient to avoid taking near bedtime; stimulation can occur
- Caution patient not to use if stimulation, restlessness, tremors occur
- Notify parents of possible excessive agitation in children
- Advise patient to notify prescriber of anxiety, slow or fast heart rate, dyspnea, seizures
- Ext rel: do not divide, crush, chew, or dissolve
- Do not use within 14 days of MAOIs
- **Beers:** Avoid in older adults, CNS stimulant effects, seizures, hallucinations, excitation

### Evaluation

**Positive therapeutic outcome**

- Decreased nasal congestion

# psyllium (OTC)

(sill'i-um)

**Hydrocil, Karacil, Konsyl Leader Fiber Laxative, Metamucil, Natural Fiber, Natural Vegetable Fiber, Reguloid, Wal-Mucil**

*Func. class.:* Laxative, bulk-forming

*Chem. class.:* Psyllium colloid

## ACTION: Bulk-forming laxative

**Therapeutic outcome:** Decreased constipation, decreased diarrhea in colitis

## USES: Chronic constipation, ulcerative colitis, irritable bowel syndrome

## CONTRAINDICATIONS

Hypersensitivity, intestinal obstruction, abdominal pain, nausea/vomiting, fecal impaction

**Precautions:** Pregnancy

## DOSAGE AND ROUTES

**Adult:** PO 1-2 tsp in 8 oz of water bid or tid, then 8 oz of water; or 1 premeasured packet in 8 oz of water bid or tid, then 8 oz of water

**Child >6 yr:** 1 tsp in 4 oz of water at bedtime

**Available forms:** Chew pieces 1.7, 3.4 g/piece; powder effervescent 3.4, 3.7 g/packet; powder 3.3, 3.4, 3.5, 4.94 g/tsp; wafers 3.4 g/wafer

### Implementation

- Give alone for better absorption; give after mixing with water immediately before use; administer with 8 oz of water or juice followed by another 8 oz of fluid
- Administer in AM or PM (oral dose)
- Shake susp well

## ADVERSE EFFECTS

**GI:** *Nausea, vomiting, anorexia, diarrhea,* cramps, intestinal/esophageal blockage

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | None |
| **Distribution** | None |
| **Metabolism** | Unknown |
| **Excretion** | Feces |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 12-24 hr |
| **Peak** | 2-4 days |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Cardiac glycosides, oral anticoagulants, salicylates: decreased absorption of each specific product

### Drug/herb

Flax, senna: increased laxative

## NURSING CONSIDERATIONS

### Assessment

- Monitor blood, urine electrolytes if used often by patient; check I&O ratio to identify fluid loss
- Assess for cramping, rectal bleeding, nausea, vomiting; if these symptoms occur, product should be discontinued; identify cause of constipation; identify whether fluids, bulk, or exercise is missing from lifestyle, assess stool for color, consistency, amount, presence of flatulence
- Assess stool for color, consistency, amount, presence of flatulence
- **Pregnancy/breastfeeding:** Generally considered safe in pregnancy, breastfeeding

### Patient/family education

- Discuss with patient that adequate fluid consumption is necessary
- Teach patient that normal bowel movements do not always occur daily
- Caution patient not to use in presence of abdominal pain, nausea, vomiting; tell patient to notify prescriber if constipation is unrelieved or if symptoms of electrolyte imbalance occur (muscle cramps, pain, weakness, dizziness, excessive thirst)
- Teach patient not to use laxatives for long-term therapy; bowel tone will be lost and will decrease
- Teach patient not to take at bedtime as a laxative; may interfere with sleep; also problems with lipid pneumonia
- Teach patient not to use with food or vitamin preparations; delays digestion and absorption of fat-soluble vitamins

### Evaluation

**Positive therapeutic outcome**

- Decreased constipation in 12-24 hr

## pyridostigmine (Rx)

(peer-id-oh-stig′meen)

**Mestinon, Mestinon SR, Regonol**

*Func. class.:* Cholinergic, anticholinesterase

*Chem. class.:* Tertiary amine carbamate

**ACTION:** Inhibits destruction of acetylcholine, which increases concentration at sites where acetylcholine is released; this facilitates transmission of impulses across myoneural junction

**Therapeutic outcome:** Decreased action of nondepolarizing muscle relaxant; increased muscle strength in myasthenia gravis

**USES:** Nondepolarizing muscle relaxant antagonist, myasthenia gravis, pretreatment in nerve gas exposure (military only)

## CONTRAINDICATIONS

Bradycardia, hypotension, obstruction of intestine, renal system, bromide, benzyl alcohol sensitivity, cholinesterase inhibitor toxicity

**Precautions:** Pregnancy seizure disorders, bronchial asthma, coronary occlusion, hyperthyroidism, dysrhythmias, peptic ulcer, megacolon, poor GI motility

## DOSAGE AND ROUTES

### Myasthenia gravis

**Adult:** PO 600 mg/day in 5-6 divided doses, max 1.5 g/day; IM/**IV** 2 mg; SUS REL 180-540 mg/day or bid at intervals of at least 6 hr

**Child:** PO 7 mg/kg/day in 5-6 divided doses; IM/**IV** 0.05-0.15 mg/kg/dose

### Nondepolarizing neuromuscular blocker antagonist

**Adult:** 0.6-1.2 mg **IV** atropine, then 0.1-0.25 mg/kg/dose

**Child:** **IV** 0.1-0.25 mg/kg/dose

### Nerve gas exposure prophylaxis (military)

**Adult:** PO 30 mg q8hr if threat of exposure to Soman gas is anticipated, start several hours before exposure and discontinue upon exposure; after this product is discontinued, give antidotes (atropine, pralidoxime)

**Available forms:** Tabs 60 mg; ext rel tabs 180 mg; syr 60 mg/5 ml; inj 5 mg/ml

### Implementation

- Only with atropine sulfate available for cholinergic crisis
- Only after all other cholinergics have been discontinued
- Increased doses for tolerance, as ordered
- Larger doses after exercise or fatigue, as ordered
- Do not break, crush, or chew sus rel tabs

**PO route**

- On empty stomach for better absorption

**IV route**

- Undiluted (5 mg/ml), give through Y-tube or 3-way stopcock, give 0.5 mg or less/min (myasthenia gravis); 5 mg/min (reversal of nondepolarizing neuromuscular blockers)

**Y-site compatibilities:** Heparin, hydrocortisone, potassium chloride, vit B/C
• Storage at room temperature

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, sweating, weakness, seizures, uncoordination, paralysis, drowsiness, LOC
**CV:** Tachycardia, dysrhythmias, bradycardia, AV block, hypotension, ECG changes, cardiac arrest, syncope
**EENT:** Miosis, blurred vision, lacrimation, vision changes
**GI:** *Nausea, diarrhea, vomiting, cramps, increased salivary and gastric secretions, peristalsis*
**GU:** Frequency, incontinence, urgency
**INTEG:** Rash, urticaria, flushing
**RESP:** Respiratory depression, bronchospasm, constriction, laryngospasm, respiratory arrest
**SYST:** Cholinergic crisis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Poorly absorbed (PO) |
| **Distribution** | Widely distributed, crosses placenta |
| **Metabolism** | Liver, plasma cholinesterase |
| **Excretion** | Kidneys |
| **Half-life** | 2 hr (**IV**); 4 hr (PO) |

### Pharmacodynamics

| | PO | PO-EXT REL | IM/IV |
|---|---|---|---|
| **Onset** | 20-30 min | ½-1 hr | 2-15 min |
| **Peak** | Unknown | Unknown | Unknown |
| **Duration** | 3-6 hr | 3-6 hr | 2-4 hr |

## INTERACTIONS

### Individual drugs

Atropine, gallamine, metocurine, pancuronium, tubocurarine: decreased action
Succinylcholine: increased action of pyridostigmine
Magnesium, mecamylamine, polymyxin, procainamide, quiNIDine: decreased action of pyridostigmine

### Drug classifications

Aminoglycosides, anesthetics, antidysrhythmics, corticosteroids, quinolones: decreased action of pyridostigmine

## NURSING CONSIDERATIONS

### Assessment

• **Myasthenia gravis:** assess for fatigue, ptosis, diplopia, difficulty swallowing, SOB, hand/gait before and after product, improvement should be seen after 1 hr
• Monitor I&O ratio; check for urinary retention or incontinence
• **Toxicity:** assess for bradycardia, hypotension, bronchospasm, headache, dizziness, seizures, respiratory depression; product should be discontinued if toxicity occurs
• Monitor VS, respiration; increased B/P during test and at baseline
• Monitor diabetic patient carefully, since this product lowers blood glucose
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding

### Patient/family education

• Advise patient to carry/wear emergency ID specifying myasthenia gravis, products taken
• Teach patient that product doesn't cure but relieves symptoms
• Teach patient to avoid driving, other hazardous activities until effect is known
• Advise patient not to drink alcohol
• Advise patient to take with food to decrease gastric side effects
• Teach patient to report weakness (cholinergic crisis, or overdose), bradycardia

### Evaluation

**Positive therapeutic outcome**
• Increased muscle strength, hand grasp, improved gait, absence of labored breathing (if severe); reversal of nondepolarizing neuromuscular blockers; prevention of nerve gas toxicity

## TREATMENT OF OVERDOSE:

Discontinue product, atropine 1-4 mg **IV**

## pyridoxine (vitamin $B_6$) (OTC, Rx)

(peer-i-dox'een)
**Equaline Vitamin $B_6$, Neuro-K, Walgreens Finest B-6, Walgreens Gold Seal Vitamin $B_6$**
*Func. class.:* Vitamin $B_6$, water soluble

**ACTION:** Needed for fat, protein, carbohydrate metabolism; enhances glycogen release from liver and muscle tissue; needed as coenzyme for metabolic transformations of a variety of amino acids

**Therapeutic outcome:** Absence of vit $B_6$ deficiency

**USES:** Vitamin $B_6$ deficiency associated with the following: inborn errors of metabolism, seizures, isoniazid therapy, oral contraceptives, alcoholism, polyneuritis

**Unlabeled uses:** Palmar-plantar erythrodysesthesia syndrome

## CONTRAINDICATION

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, Parkinson's disease, patients taking levodopa should avoid supplemental vitamins with >5 mg pyridoxine

## DOSAGE AND ROUTES

### RDA

**Adult:** PO (male) 1.7-2 mg; (female) 1.4-1.6 mg
**Child 9-13 yr:** PO 1 mg/day
**Child 4-8 yr:** PO 0.6 mg/day
**Child 1-3 yr:** PO 0.5 mg/day
**Infant 7-12 mo:** PO 0.3 mg/day

### Vitamin $B_6$ deficiency

**Adult:** PO 5-25 mg/day × 3 wk
**Child:** PO 10 mg until desired response

### Pyridoxine deficiency neuritis/seizure (not drug induced)

**Adult:** PO without neuritis 2.5-10 mg/day, after corrected 2-5 mg/day; with neuritis 100-200 mg/day × 3 wk, then 2-5 mg/day
**Child:** PO without neuritis 5-25 mg/day × 3 wk, then 1.5-2.5 mg/day in a multivitamin; with neuritis 10-50 mg/day × 3 wk, then 1-2 mg/day
**Neonate with seizures:** IM/IV 50-100 mg as a single dose

### Deficiency caused by isoniazid, cycloSERINE, hydrALAZINE, penicillamine

**Adult:** PO 100-300 mg/day
**Child:** PO 10-50 mg/day

### Prevention of deficiency caused by isoniazid, cycloSERINE, hydrALAZINE, penicillamine

**Adult:** PO 25-100 mg/day
**Child:** PO 1.2 mg/kg/day

### Palmar-plantar erythrodysesthesia syndrome (unlabeled)

**Adult:** PO 50-150 mg/day

**Available forms:** Tabs 10, 25, 50, 100 mg; ext rel tabs 100 mg; inj 100 mg/ml; ext rel caps 150 mg

### Implementation

**PO route**

- Swallow ext rel cap and ext rel tabs whole; do not break, crush, or chew

**IM route**

- Rotate sites to avoid pain; burning or stinging at site may occur; give by Z-track to minimize pain
- Store in airtight, light-resistant container

**IV route**

- Give **IV** undiluted or added to most **IV** sol; give 50 mg or less/1 min if undiluted

**Syringe compatibilities:** Doxapram

**Additive incompatibilities:** Erythromycin, iron salts, kanamycin, riboflavin, streptomycin

## ADVERSE EFFECTS

**CNS:** Paresthesia, flushing, warmth, lethargy (rare with normal renal function)
**INTEG:** Pain at inj site

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO) |
| **Distribution** | Stored in liver, muscle, brain; crosses placenta |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys, unchanged (not used) |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Chloramphenicol, cycloSERINE, hydrALAZINE, isoniazid, penicillamine: decreased effects of pyridoxine
Levodopa: decreased effects of levodopa

### Drug classifications

Contraceptives (oral), immunosuppressants: decreased effects of pyridoxine

## NURSING CONSIDERATIONS

### Assessment

- Monitor pyridoxine levels throughout treatment
- Assess nutritional status: yeast, liver, legumes, bananas, green vegetables, whole grains
- Assess for pyridoxine ($B_6$) deficiency: nausea, vomiting, dermatitis, cheilosis, seizures, irritability, dermatitis before, during treatment
- Assess neurological status: paresthesia, lethargy
- Monitor blood tests: Hct, Hgb
- **Malabsorption:** Assess for malabsorption, may require injection if abnormal GI motility or absorption is present
- **Pregnancy/breastfeeding:** Safe in pregnancy, breastfeeding

### Patient/family education

- Teach patient to avoid other vitamin supplements unless directed by prescriber
- Advise patient to increase meat, bananas, potatoes, lima beans, whole grain cereals in diet which are high in vit $B_6$
- Caution patient not to increase dosage, since serious reactions may occur

### Evaluation

**Positive therapeutic outcome**

- Absence of nausea, vomiting, anorexia, skin lesions, glossitis, stomatitis, edema, seizures, restlessness, paresthesia

PACLitaxel (Rx)
paliperidone (Rx)
pancrelipase (Rx)
pantoprazole (Rx)
pegaptanib (Rx)
pembrolizumab
penicillin G Potassium (Rx)
pentamidine (Rx)
pertuzumab
phenytoin (Rx)
pilocarpine ophthalmic
pioglitazone (Rx)
pitavastatin (Rx)
potassium bicarbonate/potassium chloride (Rx, OTC)
potassium gluconate (Rx, OTC)
pramoxine topical
prazosin (Rx)
predniSONE (Rx)
procainamide (Rx)
progesterone (Rx)
proparacaine ophthalmic
propylthiouracil (Rx)
psyllium (OTC)
PACLitaxel protein-bound particles (Rx)
palonosetron (Rx)
pancuronium (Rx)
PARoxetine (Rx)
pegfilgrastim (Rx)
penciclovir topical
penicillin G procaine (Rx)
pentazocine (Rx)
phenylephrine nasal agent
physostigmine ophthalmic
pimavanserin
piperacillin/tazobactam (Rx)
posaconazole (Rx)
potassium bicarbonate/potassium citrate (Rx, OTC)
pramipexole (Rx)
prasugrel (Rx)
prednisoLONE (Rx)
pregabalin (Rx)
procarbazine (Rx)
promethazine (Rx)
propofol (Rx)
protamine (Rx)
pyridostigmine (Rx)
palbociclib
pamidronate (Rx)
panitumumab (Rx)
pazopanib
PEMEtrexed (Rx)
penicillin G benzathine (Rx)
penicillin V (Rx)
peramivir
phenylephrine ophthalmic
phytonadione (vit $K_1$) (Rx)
pimecrolimus topical
pirfenidone
potassium acetate/potassium bicarbonate (Rx, OTC)
potassium chloride (Rx, OTC)
pramlintide (Rx)
pravastatin (Rx)
prednisoLONE ophthalmic
primidone (Rx)
prochlorperazine (Rx)
propafenone (Rx)
propranolol (Rx)
pseudoephedrine (OTC)
pyridoxine (vitamin $B_6$) (OTC, Rx)

## QUEtiapine (Rx)

(kwe-tie'a-peen)
**SEROquel, Seroquel XR**
*Func. class.:* Antipsychotic
*Chem. class.:* Dibenzodiazepine

**Do not confuse:** QUEtiapine/OLANZapine SEROquel/Serzone/SINEquan

**ACTION:** Functions as an antagonist at multiple neurotransmitter receptors in the brain including 5-$HT_{1A}$, 5-$HT_2$, DOPamine $D_1$, $D_2$, $H_1$, adrenergic $\alpha_1$, $\alpha_2$ receptors

**Therapeutic outcome:** Decreased hallucinations and disorganized thought

**USES:** Bipolar disorder, bipolar I disorder, depression, mania, schizophrenia

## CONTRAINDICATIONS

Hypersensitivity, breastfeeding

**Precautions:** Pregnancy, geriatric, long-term use, seizures, hepatic disease, breast cancer, QT prolongation, CV disease, Parkinson's, brain tumor, hematological disease, torsades de pointes, cataracts, dehydration

**BLACK BOX WARNING:** Children, suicide, dementia

## DOSAGE AND ROUTES

### Schizophrenia

**Adult:** PO (not at risk for hypotension) 25 mg bid on day 1, increase by 25-50 mg divided two to three times on day 2 and day 3 to a target of 300-400 mg/day in divided doses on day 4; make further dosage adjustments in 25-50 mg bid increments, max 800 mg/day
**Adolescents 13-17 yr:** PO 25 mg bid on day 1, 50 mg bid on day 2, 100 mg bid on day 3, 150 mg bid on day 4, 200 mg on day 5; ext rel 50 mg on day 1, then 100 mg on day 2 , 200 mg on day 3, 300 mg on day 4, 400 mg on day 5
**Geriatric:** PO ext rel 50 mg/day; may increase in 50 mg/day increments

### Bipolar I disorder

**Adult:** PO (monotherapy or as adjunct to lithium or divalproex) 50 mg bid on day 1, 100 mg on day 2 in 2 divided doses as tolerated to 400 mg on day 4; range 400-800 mg/day; ext rel give in evening 300 mg qday day 1, then 600 mg qday day 2, then adjusted as tolerated

### Psychotic disorders

**Adult:** PO 25 mg bid, titrate upward; XR: 300 mg/day in PM, range 400-800 mg/day

### Depressive disorder (inadequate response to antidepressants alone)

**Adult:** PO EXT REL 50 mg/day in the PM on day 1, 2; on day 3 give 150 mg in the PM, max 600 mg/day
**Geriatric:** PO EXT REL 50 mg; may increase by 50 mg/day based on response; ext rel 50 mg in evening, max 800 mg/day

**Available forms:** Tabs 25, 50, 100, 200, 300, 400 mg; ext rel tab 50, 150, 200, 300, 400 mg

### Implementation

- Give reduced dosage in geriatric patients
- Avoid use of CNS depressants
- Give **immediate release** without regard to meals
- Give **extended release** without food or with light meal, swallow whole, do not split, crush, chew
- Supervise ambulation until patient is stabilized on medication; do not involve in strenuous exercise program because fainting is possible; patient should not stand still for a long time
- If there is a week of absence of therapy, initiate at beginning dose
- Sips of water, sugarless candy, gum for dry mouth
- Store in airtight, light-resistant container

## ADVERSE EFFECTS

**CNS:** EPS, pseudoparkinsonism, akathisia, dystonia, tardive dyskinesia, drowsiness, insomnia, agitation, anxiety, *headache*, seizures, neuroleptic malignant syndrome, dizziness, dystonia, restless legs syndrome
**CV:** Orthostatic hypotension, tachycardia, QT prolongation, CV disease, Parkinson's disease, cardiomyopathy, myocarditis
**ENDO:** SIADH, hyperglycemia
**GI:** Nausea, anorexia, constipation, abdominal pain, dry mouth, pancreatitis
**HEMA:** Leukopenia, agranulocytosis
**INTEG:** Rash
**META:** Hyponatremia
**MISC:** Asthenia, back pain, fever, ear pain
**MS:** Rhabdomyolysis
**RESP:** Rhinitis
**SYST:** Stevens-Johnson syndrome, anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver, extensively; inhibits P450 CYP3A4 enzyme system; 83% protein |
| **Excretion** | Excretion <1% unchanged urine |
| **Half-life** | ≥6 hr |

Q

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1.5 hr |
| **Duration** | Up to 12 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
CarBAMazepine, phenytoin, rifampin, thioridazine: increased QUEtiapine clearance
Chloroquine, clarithromycin, droperidol, erythromycin, haloperidol, methadone, pentamidine: increased QT prolongation
Cimetidine: decreased QUEtiapine clearance
Erythromycin: increased effects of erythromycin
Fluconazole, itraconazole, ketoconazole: increased action of QUEtiapine
Levodopa: decreased effect of levodopa
Lithium: increased neurotoxicity
LORazepam: decreased effect of LORazepam

### Drug classifications

Analgesics (opioid), antihistamines, sedatives-hypnotics: increased CNS depression
Antihypertensives: increased hypotension
Barbiturates, glucocorticoids: increased clearance of quetiapine, decreased quetiapine effect
β-agonists, class IA/III antidysrhythmics, local anesthetics, phenothiazines (some), tricyclics: increased QT prolongation
DOPamine agonists: decreased effects of DOPamine agonists

## NURSING CONSIDERATIONS

### Assessment

- Assess CV status: QT prolongation, tachycardia, orthostatic B/P

**BLACK BOX WARNING:** Mental status before initial administration, AIMS assessment; affect, orientation, LOC, reflexes, gait, coordination, sleep pattern disturbances; suicidal thoughts/behavior (child/young adult); dementia (geriatric patients)

**BLACK BOX WARNING:** Not to be used in child <10 yr (immediate release) or <18 yr (extended release)

**BLACK BOX WARNING:** **Suicide:** restrict amount of product given, usually suicidal thoughts, behavior occur early in treatment and in children/adolescents/young adults

- Check that patient swallows all PO medication; check for hoarding or giving of medication to other patients
- Obtain baselines in blood glucose, liver function tests, neurologic status, ophthalmologic exam, weight, thyroid function tests, serum electrolytes/creatinine/lipid profile/prolactin
- Monitor B/P with patient in sitting, standing, and lying positions; take pulse and respirations q4hr during initial treatment; establish baseline before starting treatment; report drops of 30 mm Hg; obtain baseline ECG and monitor Q- and T-wave changes
- Check for dizziness, faintness, palpitations, tachycardia on rising; severe orthostatic hypotension is common
- **Serious rash:** Stevens-Johnson syndrome, discontinue product, may cause rash, fever, joint pain, lesions
- **Pancreatitis:** Assess for nausea, vomiting, severe abdominal pain
- **Identify for neuroleptic malignant syndrome:** hyperpyrexia, muscle rigidity, increased CPK, altered mental status, seizures, tachycardia, diaphoresis, hyper/hypotension, fatigue; product should be discontinued and prescriber notified immediately
- **Assess for EPS** including akathisia (inability to sit still, no pattern to movements), tardive dyskinesia (bizarre movements of the jaw, mouth, tongue, extremities), pseudoparkinsonism (rigidity, tremors, pill rolling, shuffling gait); an antiparkinson product should be prescribed
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, pregnant patients should enroll in the National Pregnancy Registry for Atypical Antipsychotics 866-961-2388, EPS may develop in the infant, breastfeeding isn't recommended, excreted in breast milk
- **Beers:** Avoid in older adults except for schizophrenia, bipolar disorder, or short-term use as an antiemetic for chemotherapy, increased risk of stroke

### Patient/family education

- Teach patient to use good oral hygiene; frequent rinsing of mouth, sugarless gum for dry mouth
- Caution patient to avoid hazardous activities until product response is determined; dizziness, blurred vision may occur
- Inform patient that orthostatic hypotension occurs often; patient should rise from sitting

or lying position gradually; avoid hot tubs, hot showers, and tub baths because hypotension may occur; inform patient that heat stroke may occur in hot weather, to take extra precautions to stay cool, drink plenty of fluids
• Advise patient to avoid abrupt withdrawal of this product or EPS may result; product should be withdrawn slowly
• Teach patient to avoid OTC preparations (cough, hayfever, cold) unless approved by prescriber; serious product interactions may occur; avoid use with alcohol, CNS depressants because increased drowsiness may occur
• Advise patient to take medication only as prescribed, not to use other products unless approved by prescriber; not to stop abruptly
• Advise patient that follow-up is necessary including LFTs, blood glucose, neurologic/ophthalmic function, cholesterol profile, weight
• If drowsiness occurs, avoid hazardous activities such as driving
• Advise patient to notify prescriber if pregnancy is planned, suspected; do not breastfeed
• Advise patient to notify prescriber immediately of fever, difficulty breathing, fatigue, sore throat, rash, bleeding

**BLACK BOX WARNING:** Suicide: To notify provider of thoughts, behavior, primarily in children/adolescents/young adults or worsening depression, severe anxiety, panic attacks, insomnia

### Evaluation
**Positive therapeutic outcome**
• Decrease in emotional excitement, hallucinations, delusions, paranoia
• Reorganization of patterns of thought, speech

## TREATMENT OF OVERDOSE:
Lavage, provide airway

## quinapril (Rx)
(kwin'a-pril)
**Accuretic, Accupril**
*Func. class.:* Antihypertensive
*Chem. class.:* Angiotensin-converting enzyme (ACE) inhibitor

**Do not confuse:** Accupril/Aciphex

**ACTION:** Selectively suppresses renin-angiotensin-aldosterone system; inhibits ACE, prevents conversion of angiotensin I to angiotensin II; results in dilatation of arterial, venous vessels

**Therapeutic outcome:** Decreased B/P in hypertension

## USES:
Hypertension, alone or in combination with thiazide diuretics, systolic HF

## CONTRAINDICATIONS
Children, hypersensitivity to ACE inhibitors, angioedema

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Breastfeeding, geriatric, impaired renal/liver function, dialysis patients, hypovolemia, blood dyscrasias, bilateral renal stenosis, cough, pregnancy 1st trimester, hyperkalemia, aortic stenosis, African descent

## DOSAGE AND ROUTES
### Hypertension
**Adult:** PO 10-20 mg/day initially, then 20-80 mg/day divided bid or daily (monotherapy), start at 2.5 mg/day (with diuretics)
**Geriatric:** PO 10 mg/day, titrate to desired response (monotherapy), start at 2.5 mg/day (with diuretics), titrate ≥ 2 wk

### Congestive heart failure
**Adult:** PO 5 mg bid, may increase qwk until 20-40 mg/day in 2 divided doses

### Renal dose
**Adult:** PO CCr 61-89 ml/min start or 10 mg/day (hypertension), 5 mg bid (heart failure); CCr 30-60 ml/min 5 mg/day initially; CCr 10-29 ml/min 2.5 mg/day initially

**Available forms:** Tabs 5, 10, 20, 40 mg

### Implementation
• Tabs may be crushed if necessary, without regard to food
• Store in airtight container at 86° F (30° C) or less
• Do not use with high-fat meal, decreases absorption
• Severe hypotension may occur after 1st dose of this medication; may be prevented by reducing or discontinuing diuretic therapy 3 days before beginning quinapril therapy

## ADVERSE EFFECTS
**CNS:** Headache, dizziness, fatigue, somnolence, depression, malaise, nervousness, vertigo, syncope
**CV:** Hypotension, postural hypotension, syncope, palpitations, *angina pectoris,* MI, tachycardia, vasodilatation, chest pain
**GI:** Nausea, diarrhea, constipation, vomiting, gastritis, GI hemorrhage, dry mouth

**GU:** Increased BUN, creatinine, decreased libido, impotence
**INTEG:** Angioedema, rash, sweating, photosensitivity, pruritus
**META:** Hyperkalemia
**MISC:** Back pain, amblyopia
**MS:** Myalgia
**RESP:** *Cough*, pharyngitis, dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | ≥60% |
| **Distribution** | Protein binding 97%, crosses placenta |
| **Metabolism** | Liver (active metabolites quinaprilat) |
| **Excretion** | Metabolites urine (60%), feces (37%) |
| **Half-life** | 2 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ½-1 hr |
| **Peak** | 1-2 hr |
| **Duration** | 24 hr |

## INTERACTIONS

### Individual drugs

Aliskiren (diabetic patients): increased hyperkalemia
Alcohol: increased hypotension (large amounts)
Lithium: increased toxicity
HydrALAZINE, prazosin: use caution
Tetracycline: decreased absorption of tetracycline

### Drug classifications

Adrenergic blockers, antihypertensives, diuretics, ganglionic blockers, nitrates, phenothiazines: increased hypotension
Diuretics (potassium sparing), potassium supplements, sympathomimetics, ACE/angiotensin II receptor antagonists, vasodilators: use caution
NSAIDs: decreased hypotensive effect of quinapril

### Drug/herb

Cough: capsaicin
Decrease antihypertensive effect: ma huang

### Drug/food

Hyperkalemia: do not use with potassium-containing salt substitutes; read label carefully

### Drug/lab test

Increased: Potassium, creatinine, BUN, LFTs

## NURSING CONSIDERATIONS

### Assessment

- **Collagen vascular disease:** monitor blood studies: neutrophils, decreased platelets; WBC with differential baseline, periodically q3mo; if neutrophils <1000/mm$^3$ discontinue treatment
- **Hypertension:** monitor B/P, check for orthostatic hypotension, syncope; if changes occur, dosage change may be required
- Monitor renal function tests (protein, BUN, creatinine) and periodically liver function tests, uric acid; glucose may be elevated; watch for increased levels that may indicate nephrotic syndrome and renal failure; monitor renal symptoms: polyuria, oliguria, frequency, dysuria
- Check potassium levels throughout treatment, although hyperkalemia rarely occurs
- **HF:** check for edema in feet, legs daily, weight daily
- **Allergic reactions:** Angioedema, rash, fever, pruritus, swelling of eyes/face/neck/throat, difficulty breathing; product should be discontinued, angioedema is more common in Black patients

**BLACK BOX WARNING:** Assess for pregnancy; pregnancy; if pregnancy is suspected, discontinue product

### Patient/family education

- Advise patient not to discontinue product abruptly; advise patient to tell all persons associated with care
- Teach patient not to use OTC products (cough, cold, allergy) unless directed by physician; serious side effects can occur; avoid high-fat meal at time of dose
- Inform patient that xanthines such as coffee, tea, chocolate, cola can prevent action of product
- Caution patient on the importance of complying with dosage schedule, even if feeling better; to continue with medical regimen to decrease B/P: exercise, cessation of smoking, decreasing stress, diet modifications
- Emphasize the need to rise slowly to sitting or standing position to minimize orthostatic hypotension; not to exercise in hot weather or increased hypotension can occur
- **Allergic reactions:** assess for allergic reactions: rash, fever, pruritus, urticaria; product should be discontinued if antihistamines fail to help
- Teach patient to notify prescriber of mouth sores, sore throat, fever, swelling of hands or feet, irregular heartbeat, chest pain, coughing, shortness of breath
- Caution patient to report excessive perspiration, dehydration, vomiting, diarrhea; may lead to fall in B/P, maintain adequate hydration

• Caution patient that product may cause dizziness, fainting, light-headedness; may occur during 1st few days of therapy; to avoid activities that may be hazardous
• Teach patient how to take B/P, and normal readings for age group
• Teach patient product may cause skin rash or impaired taste perception

**BLACK BOX WARNING:** Pregnancy, to report if pregnancy is planned or suspected, do not use in pregnancy, breastfeeding do not breastfeed

### Evaluation
**Positive therapeutic outcome**
• Decreased B/P in hypertension

## TREATMENT OF OVERDOSE:
0.9% NaCl **IV** inf, hemodialysis

**⚠ HIGH ALERT**

## quiNIDine gluconate (Rx)
(kwin'i-deen)
## quiNIDine sulfate (Rx)
*Func. class.:* Antidysrhythmic (class IA)
*Chem. class.:* QuiNINE dextro isomer

**Do not confuse:** quiNIDine/quiNINE

**ACTION:** Prolongs action potential duration and effective refractory period, thus decreasing myocardial excitability; anticholinergic properties

**Therapeutic outcome:** Treatment of dysrhythmias

**USES:** Wolff-Parkinson-White syndrome, PVST, atrial fibrillation, flutter; paroxysmal atrial tachycardia, ventricular tachycardia, malaria (**IV** quiNIDine gluconate)

**Unlabeled uses:** Singultus (hiccups)

## CONTRAINDICATIONS
Hypersensitivity or idiosyncratic response, digoxin toxicity, blood dyscrasias, myasthenia gravis, AV block

**Precautions:** Pregnancy, breastfeeding, children, geriatric, renal/hepatic disease, electrolyte imbalance, HF, respiratory depression, bradycardia, hypotension, syncope

**BLACK BOX WARNING:** Cardiac arrhythmias, MI

## DOSAGE AND ROUTES
### >> QuiNIDine sulfate
**Atrial fibrillation/flutter/PVST/WPW**
**Adult:** PO 200 mg q6-8hr × 5-8 doses; may increase daily until sinus rhythm is restored; max 4 g/day given only after digitalization; maintenance 200-300 mg tid-qid or 300-600 mg q8-12hr (EXT REL)

**Hiccups (unlabeled)**
**Adult:** PO 200 mg qid

### >> QuiNIDine gluconate
**Adult:** PO 324-648 mg q8-12hr (EXT REL); IM 600 mg, then 400 mg q2hr; **IV** give 16 mg/min

**Severe malaria**
**Adult, adolescent, child, infant:** IV INF (Regimen 1) 10 mg/kg/dose (6.25 mg/kg/dose base) over 1-2 hr, then CONT IV INF 0.02 mg/kg/min (0.0125 mg/kg/min base) × at least 24 hr, use quiNINE as step-down
(Regimen 2) 24 mg/kg/dose (15 mg/kg/dose) base IV INF over 4 hr, then 12 mg/kg/dose (7.5 mg/kg/dose base) IV INF over 4 hr q8hr after beginning of loading dose

**Available forms: Gluconate:** ext rel tabs 324, 330 mg; inj gluconate 80 mg/ml; **sulfate:** tabs 200, 300 mg; ext rel tabs 300 mg

### Implementation
• Give AV node blocker (digoxin) before starting quiNIDine to avoid increased ventricular rate
**PO route**
• Do not break, crush, or chew ext rel tab
• Give with a full glass of water with food for GI upset; may be given with meals if GI irritation occurs, absorption will be decreased
• Ext rel forms not interchangeable
• Tab may be crushed and mixed with fluid or foods for patients with swallowing difficulties
**IM route**
• Give IM injection in deltoid, aspirate to avoid intravascular administration

**Intermittent IV infusion route**
• Give after diluting 800 mg/50 ml or more $D_5W$ (16 mg/ml); give max 0.25 mg/kg/min, quiNIDine is absorbed by PVC tubing, minimize length; use inf pump

**Y-site compatibilities:** Alfentanil, amikacin, anidulafungin, argatroban, arsenic trioxide ascorbic acid, asparaginase, atenolol, atracurium, atropine, benztropine, bleomycin, bumetanide, buprenorphine, butorphanol, calcium gluconate, caspofungin, chlorproMAZINE, cimetidine, CISplatin, cyanocobalamin, cycloSPORINE, DACTINomycin, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epoetin alfa, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, gatifloxacin, gemcitabine, gentamicin, glycopyrrolate, granisetron, HYDROmorphone, IDArubicin, imipenem-cilastatin,

Q

irinotecan, isoproterenol, labetalol, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, meperidine, metaraminol, methoxamine, methyldopate, metoclopramide, metoprolol, metroNIDAZOLE, miconazole, milrinone, mitoXANtrone, morphine, multiple vitamins, mycophenolate, nalbuphine, naloxone, nesiritide, netilmicin, nitroglycerin, norepinephrine, octreotide, ondansetron, oxaliplatin, PACLitaxel, palonosetron, pamidronate, pancuronium, papaverine, pentamidine, pentazocine, phenylephrine, phytonadione, polymyxin B, potassium chloride, procainamide, prochlorperazine, promethazine, propranolol, protamine, pyridoxine, ranitidine, ritodrine, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, tirofiban, tobramycin, tolazoline, trimethoprim, urokinase, vancomycin, vasopressin, verapamil, vinorelbine, voriconazole, zoledronic acid

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness,* involuntary movement, confusion, psychosis, restlessness, irritability, syncope, excitement, depression, ataxia
**CV:** Hypotension, *bradycardia, PVCs,* heart block, cardiovascular collapse, arrest, torsades de pointes, widening QRS complex, ventricular tachycardia
**GI:** Nausea, vomiting, anorexia, *diarrhea,* hepatotoxicity, abdominal pain
**HEMA:** Thrombocytopenia, hemolytic anemia, agranulocytosis, hypoprothrombinemia
**INTEG:** Rash, urticaria, angioedema, swelling, photosensitivity, flushing with severe pruritus
**RESP:** Dyspnea, respiratory depression

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO, IM), slowly absorbed (sus rel) |
| **Distribution** | Widely distributed, crosses placenta, protein binding 80%-90% |
| **Metabolism** | Liver |
| **Excretion** | Kidney unchanged, 10%-50% breast milk |
| **Half-life** | 6-7 hr (prolonged in geriatrics, cirrhosis, HF) |

## INTERACTIONS

### Individual drugs

Amiodarone, cimetidine, NIFEdipine: increased quiNIDine level
Digoxin: increased digoxin level
NIFEdipine, sodium bicarbonate, verapamil: increased quiNIDine effect
Phenytoin, rifampin, sucralfate: decreased effects of quiNIDine
Propranolol: increased effect of propranolol
Reserpine: increased cardiac depression
Warfarin: increased levels of warfarin

### Drug classifications

Antacids, carbonic anhydrase inhibitors, hydroxide suspensions: increased effects of quiNIDine
Anticholinergic blockers: increased vagolytic effects
Anticoagulants (oral): increased levels of anticoagulant
Antidepressants (tricyclics): increased effect of antidepressant
Antidysrhythmics: increased cardiac depression
Barbiturates, cholinergics: decreased effects of quiNIDine
Neuromuscular blockers: increased neuromuscular blocking
Phenothiazines: increased cardiac depression

### Drug/herb

Hawthorn: increased quiNIDine effect, licorice

### Drug/food

Grapefruit juice: decreased absorption, decreased metabolism

### Drug/lab test

Increased: CPK
Interference: triamterene therapy interferes with quiNIDine test levels
Decrease: platelets, Hgb, granulocytes

## NURSING CONSIDERATIONS

### Assessment

• Monitor ECG continuously to determine product effectiveness, measure PR, QRS, QT intervals, check for PVCs, other dysrhythmias; monitor B/P continuously for hypo/hypertension; for

### Pharmacodynamics

| | PO (SULFATE) | (SULFATE ER) | (GLUCONATE PO) | IM | IV |
|---|---|---|---|---|---|
| **Onset** | ½ hr | | | ½ hr | 5 min |
| **Peak** | 1-6 hr | 4 hr | 3-4 hr | ½-1½ hr | Unknown |
| **Duration** | 6-8 hr | 8-12 hr | 6-8 hr | 6-8 hr | 6-8 hr |

rebound hypertension after 1-2 hr; check for dehydration or hypovolemia
• Monitor blood levels (therapeutic level 2-7 mcg/ml)
• Monitor I&O ratio, electrolytes (potassium, sodium, chloride); check weight daily; check for signs of HF or pulmonary toxicity: dyspnea, fatigue, cough, fever, chest pain; if these occur, product should be discontinued
• Monitor liver function tests: AST, ALT, bilirubin, alkaline phosphatase
• Assess for CNS symptoms: confusion, psychosis, numbness, depression, involuntary movements; if these occur, product should be discontinued
• **Monitor cardiac rate, respiration:** rate, rhythm, character, chest pain; watch for ventricular tachycardia, supraventricular tachycardia, or fibrillation that indicates toxicity
• **Pregnancy/breastfeeding:** Use only if clearly needed, avoid use in breastfeeding, excreted in breast milk

## Patient/family education

• Instruct patient to report adverse effects immediately to prescriber
• Instruct patient to complete follow-up appointments with health care provider including pulmonary function tests, chest x-ray, ophth and otoscopic exams
• Avoid grapefruit

## Evaluation

### Positive therapeutic outcome

• Resolution of dysrhythmias

QUEtiapine (Rx)
quinapril (Rx)
quiNIDine gluconate (Rx)
quiNIDine sulfate (Rx)

## RABEprazole (Rx)

(rab-ee-pray′zole)

**Aciphex, Aciphex Sprinkle, Pariet**

*Func. class.:* Proton pump inhibitor

*Chem. class.:* Benzimidazole

**Do not confuse:** Aciphex/Aricept/Accupril RABEprazole/ARIPiprazole

**ACTION:** Suppresses gastric secretion by inhibiting hydrogen/potassium ATPase enzyme system in the gastric parietal cell; characterized as a gastric acid pump inhibitor, since it blocks the final step of acid production

**Therapeutic outcome:** Absence of duodenal ulcers; decreased gastroesophageal reflux

**USES:** Gastroesophageal reflux disease (GERD), severe erosive esophagitis, poorly responsive systemic GERD, pathologic hypersecretory conditions (Zollinger-Ellison syndrome, systemic mastocytosis, multiple endocrine adenomas); treatment of duodenal ulcers with or without antiinfectives for *Helicobacter pylori;* daytime, nighttime heartburn

## CONTRAINDICATIONS

Hypersensitivity to this product or proton pump inhibitors (PPIs)

**Precautions:** Pregnancy, breastfeeding, children, Asian patients, diarrhea, geriatric patients, gastric cancer, hepatic/GI disease, IBS, osteoporosis, pseudomembranous colitis, ulcerative colitis, vit $B_{12}$ deficiency

## DOSAGE AND ROUTES

### Healing of duodenal ulcers

**Adult:** PO 20 mg/day × ≤4 wk, to be taken after breakfast

### Erosive esophagitis/GERD

**Adult:** PO Delayed release tabs 20 mg/day × 4-8 wk

**Adolescent and child ≥12 yr:** PO Delayed release tabs 20 mg/day up to 8 wk, may use an additional course

**Child 1-11 yr (≥ 15 kg):** PO (sprinkle) 10 mg qday up to 12 wk; (<15 kg) 5 mg qday up to 12 wk; may increase to 10 mg qday if needed

### *H. pylori* eradication

**Adult:** PO 20 mg bid × 7 days with amoxicillin 1 g bid × 7 days with clarithromycin 500 mg bid × 7 days

**Available forms:** Del rel tabs 20 mg; delayed release caps 5, 10 mg

### Implementation

**PO route**

- Do not break, crush, or chew del rel tab
- Give after breakfast daily with a full glass of water, without regard to food
- **Delayed-release capsule:** Open, use on a spoonful of applesauce or liquid, give immediately, (within 15 min) 2h before a meal, do not crush, chew delayed-release product

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness*

**EENT:** Tinnitus, taste perversion

**GI:** *Diarrhea, abdominal pain, vomiting, nausea, constipation, flatulence, acid regurgitation,* abdominal swelling, anorexia, CDAD, hepatitis, hepatic encephalopathy

**MISC:** *Back pain*, infection, arthralgia, myalgia, osteoporosis, fractures, Stevens-Johnson syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 96.3% |
| **Metabolism** | Liver, extensively by CYP2C19 |
| **Excretion** | Kidneys, feces, metabolites |
| **Half-life** | 1-2 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Digoxin, methotrexate, nelfinavir/omeprazole: increased levels

Ketoconazole, itraconazole, iron salts, atazanavir/ritonavir, ampicillin, cycloSPORINE: decreased levels

Calcium carbonate, sucralfate, vitamin $B_{12}$: decreased rabeprazole levels

Clarithromycin, phenytoin: increased levels of rabeprazole

Warfarin, clopidogrel: increased bleeding risk

### Drug classifications

Benzodiazepines, antacids, other proton pump inhibitors, $H_2$ blockers: increased levels of rabeprazole

Protease inhibitors: Decreased level of protease inhibitors

### Drug/herb

St. John's wort: decreased levels of rabeprazole

### Drug/lab test

Decreased: magnesium

## NURSING CONSIDERATIONS

### Assessment

- Assess GI system: bowel sounds q8hr, abdomen for pain and swelling, anorexia
- CDAD may occur with most antibiotic therapy; assess for watery diarrhea, abdominal pain, fever, may occur several weeks after treatment concludes
- **Vitamin $B_{12}$ deficiency/cyanocobalamin/hypomagnesemia:** may occur several weeks after treatment concludes; use magnesium, vit $B_{12}$, cyanocobalamin supplement, if severe, discontinuing of product may be needed
- Monitor hepatic enzymes: AST, ALT, increased alkaline phosphatase during treatment
- Assess for low magnesium level: tremors, muscle soreness, spasms, anxiety, change in heart rate, palpitations, obtain magnesium level
- **Blood dyscrasias (rare):** CBC with differential before and periodically during treatment
- Obtain susceptibility testing if *H. pylori* treatment is ineffective; another antiinfective may be needed
- **Osteoporosis/fractures:** May occur with prolonged high-dose use, usually in those 50 yr, make sure adequate vitamin D and calcium are taken
- **Beers:** Avoid scheduled use >8 wk in older adults unless for high-risk patients

### Patient/family education

- Advise patient to report severe diarrhea; product may have to be discontinued
- Advise patient to notify prescriber if pregnancy is planned or suspected
- Teach patient to report diarrhea, black, tarry stools, product may need to be discontinued
- Inform diabetic patient that hypoglycemia can occur
- Caution patient to avoid driving and other hazardous activities until response to product is known, take delayed release tab whole, do not cut, break; that cap should be opened and sprinkled on food (applesauce), to take within 15 min and 30 min before a meal
- Caution patient to avoid alcohol, salicylates, NSAIDs; may cause GI irritation
- Advise patient to wear sunscreen, protective clothing to prevent burns

### Evaluation

**Positive therapeutic outcome**

- Absence of epigastric pain, swelling, fullness; decreased symptoms of GERD after 4-8 wk

## raloxifene (Rx)

(ral-ox'ih-feen)

**Evista**

*Func. class.:* Bone resorption inhibitor

*Chem. class.:* Hormone modifier, selective estrogen receptor modulator (SERM)

**ACTION:** Tissue-selective estrogen agonist/antagonist; agonist activity in bone and lipid metabolism, antagonistic activity on breast and uterus, reduces resorption of bone and decreases bone turnover

**Therapeutic outcome:** Absence or decrease of osteoporosis in postmenopausal women

**USES:** Prevention, treatment of osteoporosis in postmenopausal women, breast cancer prophylaxis in postmenopausal women with osteoporosis or in postmenopausal women at high risk for developing the disease, invasive breast cancer risk reduction

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity

**BLACK BOX WARNING:** Women with active or history of venous thromboembolic events

**Precautions:** Hepatic/CV disease, cervical/uterine cancer, elevated triglycerides, pulmonary embolism

**BLACK BOX WARNING:** Stroke

## DOSAGE AND ROUTES

### Hormone replacement

**Postmenopausal women:** PO 60 mg/day, max 60 mg/day

**Available forms:** Tabs 60 mg

### Implementation

- Administer without regard to meals
- Add calcium supplement, vit D if lacking
- Do not use during prolonged bed rest

## ADVERSE EFFECTS

**CNS:** Insomnia, depression, migraines, fever

**CV:** Hot flashes, peripheral edema, thromboembolism, stroke, chest pain

**EENT:** pharyngitis, sinusitis, laryngitis

**GI:** *Nausea,* vomiting, diarrhea, dyspepsia, abdominal pain

**GU:** Vaginitis, leukorrhea, *hot flashes,* cystitis, vaginal bleeding

**INTEG:** Rash, sweating

**META:** Weight gain, peripheral edema

**MS:** Arthralgia, myalgia, *leg cramps,* arthritis

**RESP:** Sinusitis, pharyngitis, increased cough, pneumonia, laryngitis, rhinitis, bronchitis, pulmonary embolism, flulike symptoms

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Highly protein bound |
| **Metabolism** | Unknown |
| **Excretion** | Feces, breast milk |
| **Half-life** | 28-32 hr (elimination) |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | 24 hr |

## INTERACTIONS

### Individual drugs

Ampicillin, cholestyramine: decreased action of raloxifene

Desiccated thyroid, levothyroxine, liotrix: decreased action

### Drug classifications

Anticoagulants: decreased action of anticoagulants

Highly protein-bound products, systemic estrogens: administer cautiously ibuprofen, diazepam, naproxen

### Drug/food

Soy: decreased effect of raloxifene

### Drug/lab test

Increased: apolipoprotein, corticosteroid-binding globulin, thyroxine-binding globulin (TBG)

Decreased: lipoprotein, LDL cholesterol, total cholesterol, calcium, total protein, albumin

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** For history of stroke, TIA, thrombosis, atrial fibrillation, hypertension, smoking; venous thrombosis may occur; avoid prolonged sitting, discontinue 3 days before surgery or other immobilization

- Obtain bone density test baseline, periodically throughout treatment; bone-specific alkaline phosphatase; osteocalcin, collagen breakdown
- Monitor B/P q4hr, watch for increase caused by $H_2O$ and sodium retention

### Patient/family education

**BLACK BOX WARNING:** Teach patients to discontinue product 72 hr before prolonged bedrest, to report possible blood clots immediately, usually during first few months of therapy

- **Teach patient not to use in pregnancy, breastfeeding**
- Advise patient to avoid maintaining one position for long periods
- Advise patient to take calcium supplements, vit D if intake is inadequate
- Advise patient to increase exercise using weights
- Advise patient to stop smoking and to decrease alcohol consumption
- Inform patient that this product does not help control hot flashes
- Instruct patient to report fever, acute migraine, insomnia, emotional distress, UTI, or vaginal itching, uterine bleeding (abnormal), breast lumps
- **Pregnancy:** To notify prescriber if pregnancy is planned or suspected, not to use in pregnancy or breastfeeding
- Provide product package insert and discuss with patient

**BLACK BOX WARNING:** Teach patient to report swelling, warmth, or pain in calves

### Evaluation

**Positive therapeutic outcome**

- Prevention, treatment of osteoporosis

## raltegravir (Rx)

(ral-teg′ra-vir)

**Isentress**

*Func. class.:* Antiretroviral

*Chem. class.:* HIV integrase strand transfer inhibitor (ISTIs)

**ACTION:** Inhibits catalytic activity of HIV integrase, which is an HIV-encoded enzyme needed for replication

**Therapeutic outcome:** Improvement in CD4, T-cell counts

**USES:** HIV in combination with other antiretrovirals

## CONTRAINDICATIONS

Hypersensitivity, breastfeeding

**Precautions:** Pregnancy, children, geriatric, hepatic disease, immune reconstitution syndrome, hepatitis, antimicrobial resistance, lactase deficiency

## DOSAGE AND ROUTES

**Adult and adolescent ≥16 yr:** PO 400 mg bid, if using with rifampin give 800 mg bid

**Available forms:** Tabs 400 mg; chew tabs 25, 100 mg; granules for oral suspension 100 mg

### Implementation

**PO route**

- Tablets and chew tablets are not interchangeable
- Chew tabs should be chewed or swallowed whole
- Do not break, crush, or chew tabs
- May give without regard to meals, with 8 oz of water
- Store at room temperature

**Oral suspension**

- Open foil; use 5 ml of water in provided measuring cup; close, then swirl; don't turn upside down; use oral syringe to administer; use within 30 min; discard any remaining suspension

## ADVERSE EFFECTS

**CNS:** *Fatigue,* fever, *dizziness, headache,* asthenia, suicidal ideation
**CV:** MI
**GI:** *Nausea,* vomiting, diarrhea, abdominal pain, gastritis, hepatitis
**GU:** Oliguria, proteinuria, hematuria, glomerulonephritis, acute renal failure, renal tubular necrosis
**HEMA:** Anemia, neutropenia
**INTEG:** Rash, urticaria, pruritus, pain or phlebitis at IV site, unusual sweating, alopecia
**META:** Hyperamylasemia, hyperglycemia
**MS:** Myopathy, rhabdomyolysis
**SYST:** Immune reconstitution syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Max 3 hr if taken on empty stomach |
| **Distribution** | Unknown |
| **Metabolism** | Liver by uridine diphosphate glucuronosyltransferase (Genetic Warning UGT1A1 enzyme system) |
| **Excretion** | 51% feces, 32% urine |
| **Half-life** | Terminal 9 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Rifampin, efavirenz, tenofovir, tipranavir/ritonavir: decreased raltegravir levels

### Drug classifications

Fibric acid derivatives, HMG-CoA reductase inhibitors: increased rhabdomyolysis, myopathy, elevated CPK
$H_2$ blockers, protein pump inhibitors, UGT1A1 inhibitors (atazanavir): increased raltegravir effect

### Drug/lab test

Increased: total/HDL/LDL cholesterol

## NURSING CONSIDERATIONS

### Assessment

- **Rhabdomyolysis:** Assess for muscle pain, dark urine, increased CPK; product should be discontinued
- **HIV infection:** monitor CD4, T-cell count, plasma HIV RNA, viral load; resistance testing prior to therapy and at treatment failure
- **Suicidal thoughts, behavior:** monitor for depression, more common in those with mental illness
- **Immune reconstitution syndrome:** usually during initial phase of treatment, may give antiinfective before starting, opportunistic infections or autoimmune disorders
- Monitor total HDL/LDL cholesterol baseline and periodically; all may be elevated; pregnancy test, CBC with differential, hepatitis B serology, plasma hepatitis C RNA, urinalysis, blood glucose, LFTs serum bilirubin (total and direct)
- Assess skin eruptions: rash, urticaria, itching
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, pregnant patients need to enroll in the Antiretroviral Pregnancy Registry 800-258-4263, do not breastfeed

### Patient/family education

- Teach patient to take as prescribed; if dose is missed, take as soon as remembered up to 1 hr before next dose; do not double dose, do not share with others
- Teach patient to report rash, muscle pain
- Teach patient that sexual partners need to be told that patient has HIV
- Advise patient that product does not cure infection, just controls symptoms, does not prevent infecting others
- Teach patient to report sore throat, fever, fatigue (may indicate immune reconstitution syndrome)
- Advise patient that product must be taken in equal intervals 2×/day to maintain blood levels for duration of therapy
- Advise patient to notify prescriber immediately of suicidal thoughts, behavior
- **Pregnancy:** Advise patient to notify prescriber if pregnancy is planned or suspected, not to breastfeed

### Evaluation

**Positive therapeutic outcome**

- Improvement in CD4, T-cell counts

R

**⚠ HIGH ALERT**

## ramelteon (Rx)

(rah-mel'tee-on)

**Rozerem**

*Func. class.:* Sedative-hypnotic, anti-anxiety

*Chem. class.:* Melatonin receptor agonist

**Do not confuse:** Rozerem/Razadyne

**ACTION:** Binds selectively to melatonin receptors ($MT_1$, $MT_2$); thought to be involved in circadian rhythm and the normal sleep-wake cycle

**Therapeutic outcome:** Ability to fall asleep easily and decrease early-morning awakenings

**USES:** Insomnia (difficulty with sleep onset)

## CONTRAINDICATIONS

Breastfeeding, infants, children, hypersensitivity

**Precautions:** Pregnancy, hepatic disease, alcoholism, seizure disorder, sleep apnea, suicidal ideation, angioedema, depression, sleep-related behavior (sleepwalking), schizophrenia, bipolar disorder, alcohol intoxication, hepatic encephalopathy, aortic stenosis

## DOSAGE AND ROUTES

**Adult:** PO 8 mg within 30 min of bedtime

### Hepatic dose

Do not use in severe hepatic disease; use with caution in mild to moderate hepatic disease

**Available forms:** Tabs 8 mg

### Implementation

- Give within 30 min of bedtime for sleeplessness, give on empty stomach for fast onset
- Store in tight container in cool environment
- Do not break tabs, swallow whole

## ADVERSE EFFECTS

**CNS:** Dizziness, somnolence, fatigue, headache, insomnia, depression, complex sleep-related reactions: sleep driving, sleep eating, suicidal thoughts/behavior, syncope

**GI:** Nausea, diarrhea, dysgeusia, vomiting

**MISC:** Myalgia, arthralgia, decreased blood cortisol, influenza, upper respiratory tract infection

**SYST:** Severe allergic reactions, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Protein binding 82% |
| **Metabolism** | Rapid first-pass metabolism, liver |
| **Excretion** | 84% urine, 4% feces |
| **Half-life** | 2-5 hr metabolite |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | ½-1 ½ hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol, ciprofloxacin, fluconazole, fluvoxaMINE, ketoconazole: increased ramelteon effect, toxicity

Rifampin: decreased effect of ramelteon

### Drug classifications

Antiretroviral protease inhibitors: possible toxicity

Anxiolytics, azole antifungals, barbiturates, CYP1A2 inhibitors, strong CYP2C9 inhibitors, strong CYP3A4 inhibitors hypnotics, sedatives: increased ramelteon effect, toxicity

Strong CYP inducers: decreased ramelteon effect

Potassium-sparing diuretics, potassium supplement, angiotensin II receptor agonists: increased hyperkalemia

### Drug/food

High-fat/heavy meal: prolonged absorption, sleep onset reduced

### Drug/lab test

Increased: protein level

Decreased: testosterone level

## NURSING CONSIDERATIONS

### Assessment

- **Sleep characteristics:** assess type of sleep problem: falling asleep, staying asleep; complex sleep disorders (sleep walking/driving/eating) after taking product
- Assess mental status: mood, sensorium, affect, memory (long, short), suicidal thoughts/behaviors
- **Severe hypersensitivity reactions:** Assess for angioedema (facial swelling); discontinue product; notify prescriber immediately
- **Beers:** Avoid in older adults with a high risk of delirium, delirium might be induced or worsened
- **LFTS:** Before treatment, periodically

• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, may be toxic to fetus, cautious use in breastfeeding, excretion is unknown

### Patient/family education

• Advise patient to avoid driving or other activities requiring alertness until product is stabilized; drowsiness may continue the next day
• Advise patient to avoid alcohol ingestion or CNS depressants
• Teach patient alternative measures to improve sleep: reading, exercise several hr before bedtime, warm bath, warm milk, TV, self-hypnosis, deep breathing
• Teach patient to report if pregnancy is planned or suspected, avoid breastfeeding
• Advise patient to take within 30 min before going to bed
• Advise patient not to ingest a high-fat/heavy meal before taking
• Teach patient to report cessation of menses, galactorrhea (women), decreased libido, infertility, worsening of insomnia, behavioral changes, suicidal thoughts/behavior
• Med guide should be given to patient and reviewed

### Evaluation

**Positive therapeutic outcome**
• Ability to sleep at night, decreased amount of early-morning awakening

## ramipril (Rx)

(ra-mi′pril)
**Altace**
*Func. class.:* Antihypertensive
*Chem. class.:* Angiotensin-converting enzyme (ACE) inhibitor

**Do not confuse:** ramipril/enalapril, Altace/alteplase

**ACTION:** Selectively suppresses renin-angiotensin-aldosterone system; inhibits ACE; prevents conversion of angiotensin I to angiotensin II; results in dilatation of arterial, venous vessels

**Therapeutic outcome:** Decreased B/P in hypertension

**USES:** Hypertension, alone or in combination with thiazide diuretics; HF (after MI), reduction in risk of MI, stroke, death from CV disorders

## CONTRAINDICATIONS

Breastfeeding, children, hypersensitivity to ACE inhibitors, history of ACE inhibitor–induced angioedema

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Impaired renal/liver function, dialysis patients, hypovolemia, blood dyscrasias, COPD, HF, asthma, geriatric, renal artery stenosis, cough, African descent

## DOSAGE AND ROUTES

### Hypertension

**Adult:** PO 2.5 mg/day initially, then 2.5-20 mg/day divided bid or daily

### HF/Post MI

**Adult:** PO 1.25-2.5 mg bid, may increase to 5 mg bid

### Reduction in risk of MI, stroke, death

**Adult:** PO 2.5 mg/day × 7 days, then 5 mg/day × 21 days, then may increase to 10 mg/day

### Renal impairment

**Adult:** PO CCr <40 ml/min; reduce by 50%, titrate upward to max 5 mg/day

**Available forms:** Caps 1.25, 2.5, 5, 10 mg

### Implementation

• Caps may be opened and added to food, mixture is stable for 24 hr at room temperature, 48 hr refrigerated
• Swallow cap or tablets whole, do not chew, crush
• Store in airtight container at 86° F (30° C) or less

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness,* anxiety, insomnia, paresthesia, fatigue, depression, malaise, vertigo
**CV:** *Hypotension,* chest pain, palpitations, angina, syncope, dysrhythmia, heart failure, MI
**GI:** Nausea, constipation, vomiting, dyspepsia, dysphagia, anorexia, diarrhea, abdominal pain
**GU:** Proteinuria, increased BUN, creatinine, impotence
**INTEG:** Rash, sweating, photosensitivity, pruritus
**META:** *Hyperkalemia,* hyperglycemia
**MS:** Arthralgia, arthritis, myalgia
**RESP:** Cough, dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Not known, crosses placenta |
| **Metabolism** | Liver, extensively; protein binding 73% |
| **Excretion** | Urine |
| **Half-life** | Ramipril (5 hr), ramiprilat (13-17 hr) |

R

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ½-1 hr |
| **Peak** | 1-3 hr |
| **Duration** | 24-72 hr |

## INTERACTIONS

### Individual drugs

Do not use with aliskiren in moderate-severe renal disease
Alcohol: increased hypotension (large amounts)
Lithium: increased serum levels
HydrALAZINE, prazosin: increased toxicity
Indomethacin: decreased antihypertensive effect

### Drug classifications

Adrenergic blockers, antihypertensives, diuretics, ganglionic blockers, nitrates: increased hypotension
Antacids: decreased absorption
Diuretics (potassium sparing), potassium supplements, sympathomimetics, vasodilators: increased toxicity
NSAIDs, salicylates: decreased antihypertensive effect

### Drug/food

Potassium salt substitutes: increased hyperkalemia, avoid use

### Drug/herb

Hawthorn: increased antihypertensive effect
Ephedra: decreased antihypertensive effect

### Drug/lab test

Increased: LFTs, BUN, creatinine, glucose, potassium
Decreased: RBC, Hgb, platelets

## NURSING CONSIDERATIONS

### Assessment

- **Monitor blood tests:** neutrophils, decreased platelets; WBC with differential baseline, periodically q3mo; if neutrophils are $<1000/mm^3$, discontinue treatment
- **Hypertension: Monitor B/P baseline and regularly, check for orthostatic hypotension, syncope; if changes occur, dosage may need to be changed**
- **Renal disease:** Monitor renal function tests: protein, BUN, creatinine, potassium, sodium; watch for increased levels that may indicate nephrotic syndrome and renal failure; monitor renal symptoms: polyuria, oliguria, frequency, dysuria; establish baselines in renal, liver function tests before therapy begins and monitor periodically; liver function tests, uric acid, and glucose may be increased
- Check potassium levels throughout treatment, hyperkalemia occurs
- **HF:** check for edema in feet, legs daily, weight daily
- **Allergic reactions:** angioedema, Stevens-Johnson syndrome; rash, fever, pruritus, urticaria; product should be discontinued if antihistamines fail to help
- Monitor electrolytes baseline and periodically, potassium may be increased

### Patient/family education

- Caution patient not to discontinue product abruptly; advise patient to tell all persons associated with care
- Teach patient not to use OTC products (cough, cold, allergy) unless directed by physician; serious side effects can occur; xanthines such as coffee, tea, chocolate, cola can prevent action of product
- Instruct patient on the importance of complying with dosage schedule, even if feeling better; to continue with medical regimen to decrease B/P: exercise, cessation of smoking, decreasing stress, diet modifications
- Emphasize the need to rise slowly to sitting or standing position to minimize orthostatic hypotension; not to exercise in hot weather because increased hypotension can occur
- Teach patient to notify prescriber of mouth sores, sore throat, fever, swelling of hands or feet, irregular heartbeat, chest pain, coughing, shortness of breath
- Caution patient to report excessive perspiration, dehydration, vomiting, diarrhea; may lead to fall in B/P, maintain hydration
- Caution patient that product may cause dizziness, fainting, light-headedness; may occur during 1st few days of therapy; to avoid activities that may be hazardous
- Teach patient how to take B/P, and normal readings for age group

**BLACK BOX WARNING:** Inform prescriber if pregnancy is planned, do not use in pregnancy, breastfeeding

### Evaluation

**Positive therapeutic outcome**
- Decreased B/P in hypertension

## TREATMENT OF OVERDOSE:

0.9% NaCl **IV** inf, hemodialysis

## ranibizumab (Rx)

(ran-ih-biz'oo-mab)
**Lucentis**
*Func. class.:* Ophthalmic
*Chem. class.:* Selective vascular endothelial growth factor antagonist

**ACTION:** Binds to receptor-binding site of active forms of vascular endothelial growth

factor A (VEGF-A) that causes angiogenesis and cell proliferation

**Therapeutic outcome:** Prevention of increasing neovascular macular degeneration

**USES:** Macular degeneration age-related (neovascular) (wet), macular edema after retinal vein occlusion (RVO)

## CONTRAINDICATIONS

Hypersensitivity, ocular infections

**Precautions:** Pregnancy, breastfeeding, children, retinal detachment, increased intraocular pressure

## DOSAGE AND ROUTES

**Adult:** Intravitreal 0.3 mg (0.05 ml) of 10 mg/ml q28 days or 0.5 mg qmonth × 4 months, then 0.5 mg q3mo

**Available forms:** Sol for inj 6 mg/ml, 10 mg/ml

### Implementation

- Given by ophthalmologist via intravitreal injection using adequate anesthesia; use 19-gauge filter
- Store in refrigerator; do not freeze
- Protect from light

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, peripheral neuropathy
**EENT:** Blepharitis, cataract, conjunctival hemorrhage/hyperemia, detachment of the retinal pigment epithelium, dryness/irritation/pain in the eye, visual impairment, vitreous floaters, ocular infection
**GI:** Constipation, nausea
**MISC:** Hypertension, UTI, thromboembolism, non-ocular bleeding, anemia, arthralgia
**RESP:** Bronchitis, cough, sinusitis, URI
**INTEG:** Impaired wound healing

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Minimal |
| **Distribution** | None |
| **Metabolism** | None |
| **Excretion** | Elimination 9 days |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1 day |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Verteporfin photodynamic therapy (PDT): increased severe inflammation

## NURSING CONSIDERATIONS

### Assessment

- Assess for eye changes: redness, sensitivity to light, vision change, intraocular pressure change; report to ophthalmologist immediately, complete procedure with anesthesia and antibiotic prior to use, check perfusion of optic nerve after use

### Patient/family education

- Teach patient that if eye becomes red, sensitive to light, or painful or if there is a change in vision, seek immediate care from ophthalmologist
- Teach patient reason for treatment, expected results, that product is injected into the eye, an anesthetic will be used
- **Hypersensitivity: monitor for inflammation**

### Evaluation

**Positive therapeutic outcome**

- Prevention of increasing neovascular macular degeneration

## ranitidine (Rx)

(ra-nit'i-deen)
**Acid Reducer, Nu-Ranit, Zantac, Zantac-C, Zantac EFFER-dose**
*Func. class.:* $H_2$ histamine receptor antagonist

**Do not confuse:** ranitidine/amantadine/rimantadine, Zantac/Xanax/Zofran/ZyrTEC

**ACTION:** Inhibits histamine at $H_2$ receptor site in the gastric parietal cells, which inhibits gastric acid secretion

**Therapeutic outcome:** Healing of duodenal ulcers or gastric ulcers; prevention of duodenal ulcers; decreased symptoms of gastroesophageal reflux disease (GERD), Zollinger-Ellison syndrome, or heartburn

**USES:** Short-term treatment of duodenal and gastric ulcers and maintenance; management of GERD, Zollinger-Ellison syndrome, active duodenal ulcers with *Helicobacter pylori* in combination with clarithromycin, hypersecretory conditions, stress ulcers, erosive esophagitis (maintenance), systemic mastocytosis, multiple endocrine adenoma syndrome, heartburn

**Unlabeled uses:** Prevention of aspiration pneumonitis, upper GI bleeding

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, child <12 yr, renal/hepatic disease

## DOSAGE AND ROUTES

### Erosive esophagitis

**Adult:** PO 150 mg qid for up to 12 wk
**Child ≥1 mo:** PO 5-10 mg/kg/day in 2-3 divided doses

### Duodenal ulcer

**Adult:** PO 150 mg bid or 300 mg/day after PM meal or at bedtime, maintenance 150 mg at bedtime
**Infant and child:** PO 2-4 mg/kg bid, max 300 mg/day

### Zollinger-Ellison syndrome

**Adult:** PO 150 mg bid, may increase if needed

### Gastric ulcer

**Adult:** PO 150 mg bid × 6 wk, then 150 mg at bedtime
**Infant/child:** PO 2-4 mg/kg bid, max 300 mg/day

### GERD

**Adult:** PO 150 mg bid

### Renal dose

**Adult:** CCr <50 ml/min give 50% of dose or extend dosing interval

**Available forms:** Tab 75, 150, 300 mg; sol for inj 25 mg/ml; caps 150, 300 mg; syrup 15 mg/ml

### Implementation

- Store at room temp
- Give qday dose at bedtime

**PO route**

- May be given with or without meals
- Give antacids 1 hr before or 1 hr after this product

**IM route**

- No dilution needed; inject in large muscle mass, aspirate

**IV direct route**

- Dilute to max 2.5 mg/ml (50 mg/20 ml) using 0.9% NaCl (nonpreserved) or $D_5W$, give dose over ≥5 min (max 4 mg/ml)

**Intermittent IV INF route**

- Dilute to max 0.5 mg/ml with $D_5W$, 0.9% NaCl, give over 15-20 min (5-7 ml/min); premixed ready-to-use bags as 1 mg/ml (50 mg/50 ml), inf over 15-20 min

**Continuous 24 hr IV INF route**

- **Adult:** dilute 150 mg/250 ml of $D_5W$ or 0.9% NaCl, run over 24 hr (6.25 mg/hr or as directed); use inf device and use within 48 hr; *Zollinger-Ellison:* dilute in $D_5W$ or 0.9% NaCl, max concentration 2.5 mg/ml, use inf device

**Y-site compatibilities:** Acyclovir, aldesleukin, alemtuzumab, alfentanil, allopurinol, amifostine, amikacin, aminophylline, amphotericin B liposome, amsacrine, anakinra, anidulafungin, ascorbic acid, atracurium, atropine, aztreonam, bivalirudin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, ceFAZolin, cefepime, cefonicid, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, ceftAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, digoxin, diltiazem, DOBUTamine, DOCEtaxel, DOPamine, doripenem, doxacurium, doxapram, DOXOrubicin, DOXOrubicin liposome, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, epoetin alfa, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, fluorouracil, folic acid, foscarnet, furosemide, ganciclovir, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hydrocortisone, HYDROmorphone, IDArubicin, ifosfamide, imipenem/cilastatin, inamrinone, indomethacin, isoproterenol, ketorolac, labetalol, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, metaraminol, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, mitoXANtrone, morphine, nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pancuronium, papaverine, PEMEtrexed, penicillin G, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, phytonadione, piperacillin/tazobactam, potassium chloride, procainamide, prochlorperazine, promethazine, propofol, propranolol, protamine, pyridoxine, remifentanil, riTUXimab, rocuronium, sargramostim, sodium acetate/bicarbonate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiopental, thiotepa, ticarcillin/clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, trastuzumab, trimetaphan, urokinase, vancomycin, vecuronium, vinCRIStine, vinorelbine, warfarin, zidovudine, zoledronic acid

**Y-site incompatibilities:** Amphotericin B cholesteryl, caspofungin, diazepam, diazoxide, insulin, pantoprazole, phenytoin, quinupristin/dalfopristin, trimethoprim/sulfamethoxazole

## ADVERSE EFFECTS

**CNS:** Headache, sleeplessness, dizziness, confusion, agitation, depression; hallucinations (geriatric)
**EENT:** Blurred vision, increased ocular pressure
**GI:** Constipation, abdominal pain, diarrhea, nausea, vomiting, hepatotoxicity

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO, IM), completely absorbed (**IV**) |
| **Distribution** | Widely distributed, crosses placenta |
| **Metabolism** | Liver (30%) |
| **Excretion** | Kidneys unchanged (70%) |
| **Half-life** | 2-3 hr, increased renal disease |

### Pharmacodynamics

| | PO | IM/IV |
|---|---|---|
| **Onset** | Unknown | Unknown |
| **Peak** | 2-3 hr | 15 min |
| **Duration** | 8-12 hr | 8-12 hr |

## INTERACTIONS

### Individual drugs

Adefovir, pramipexole, procainamide, trospium, triazolam, memantine, saquinavir: increased effect of each product
Diazepam, metoclopramide: decreased absorption of ranitidine
Ketoconazole: decreased effect of ketoconazole
NIFEdipine, ext rel products: increased GI obstruction risk
Procainamide: increased absorption, toxicity

### Drug classifications

Anticholinergics, antacids: decreased ranitidine absorption
Anticoagulants, sulfonylureas: increased absorption, toxicity
Benzodiazepines, calcium channel blockers: increased effect of each product
Cephalosporins: decreased effects of cephalosporins
Iron salts: decreased effects of iron salts

### Drug/lab test

Increased: AST, creatinine, ALT
False positive: urine protein (multistix)

## NURSING CONSIDERATIONS

### Assessment

- **GI complaints:** assess patient with ulcers or suspected ulcers: epigastric or abdominal pain, hematemesis, occult blood in stools, blood in gastric aspirate before, throughout treatment
- Monitor I&O ratio, BUN, creatinine, CBC with differential monthly
- **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding, excreted in breast milk
- **Beers:** Avoid in older adults with or at high risk of delirium, may induce or make delirium worse, report confusion

### Patient/family education

- Caution patient that gynecomastia, impotence may occur and are reversible after treatment is discontinued
- Advise patient to avoid driving, other hazardous activities until stabilized on this medication; drowsiness or dizziness may occur
- Inform patient that smoking decreases the effectiveness of the product; that smoking cessation should be considered
- Instruct patient that product must be continued for prescribed time to be effective and taken exactly as prescribed; doses should not be doubled; a missed dose should be taken when remembered up to 1 hr before next dose
- Advise patient to report bruising, fatigue, malaise; blood dyscrasias may occur
- Inform patient to report diarrhea, black tarry stools, sore throat, rash, dizziness, confusion, or delirium to prescriber immediately
- Teach patient to take once-daily dose before bedtime
- Teach patient to report immediately coffee-grounds emesis, black tarry stools, abdominal pain, cramping

### Evaluation

**Positive therapeutic outcome**

- Decreased pain in abdomen, heartburn
- Healing of ulcers
- Absence of gastroesophageal reflux

## ranolazine (Rx)

(ruh-no'luh-zeen)
**Ranexa**
*Func. class.:* Antianginal
*Chem. class.:* Piperazine derivative

**ACTION:** Antianginal, antiischemic; unknown, may work by inhibiting portal fatty-acid oxidation

**Therapeutic outcome:** Decreased anginal pain and number of episodes

**USES:** Chronic stable angina pectoris; use in those that have not responded to other treatment options; should be used in combination with

R

other antianginals such as amlodipine, β-blockers, or nitrates

## CONTRAINDICATIONS

Preexisting QT prolongation, hepatic disease (Child-Pugh class A, B, C), hypersensitivity, hypokalemia, renal failure, torsades de pointes, ventricular dysrhythmia, ventricular tachycardia, hepatic cirrhosis

**Precautions:** Pregnancy, breastfeeding, children, geriatric, renal disease, hypotension, females at risk for torsades de pointes

## DOSAGE AND ROUTES

### Chronic angina

**Adult:** PO 500 mg bid and increased to 1000 mg bid based on response; max 1000 mg bid

**Available forms:** Ext rel tabs 500, 1000 mg; limit to 500 mg bid in those taking moderate CYP3A4 inhibitors

### Implementation

- Use in combination with H2 blockers, metroNIDAZOLE, proton pump inhibitor, and clarithromycin for *H. pylori*
- **Ext rel tabs:** Do not break, crush, or chew tabs; give products as prescribed; do not double or skip dose
- Give bid, without regard to meals
- Do not use with grapefruit juice or grapefruit

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness,* hallucinations
**CV:** Palpitations, QT prolongation, orthostatic hypotension
**EENT:** Tinnitus
**GI:** Nausea, vomiting, constipation, dry mouth
**MISC:** Peripheral edema
**RESP:** Dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Varied absorption |
| **Distribution** | Protein binding 62% |
| **Metabolism** | Liver, extensively by CYP3A, CYP2D6 (lesser) |
| **Excretion** | Urine 75%, feces 25% |
| **Half-life** | 7 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-5 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Haloperidol, chloroquine, droperidol, pentamidine, arsenic trioxide, levomethadyl; CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone): increased QT prolongation
Digoxin, simvastatin: increased action of digoxin, simvastatin
Diltiazem, dofetilide, ketoconazole, PARoxetine, quiNIDine, sotalol, thioridazine, verapamil, ziprasidone: increased ranolazine action

### Drug classifications

Anti-retroviral protease inhibitors: increased ranolazine absorption, toxicity
Class IA/III antidysrhythmics, some phenothiazines, β-agonists, local anesthetics, tricyclics; CYP3A4 inhibitors (amiodarone, clarithromycin, erythromycin, telithromycin, troleandomycin); CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone): increased QT prolongation
Macrolide antibiotics, protease inhibitors: increased ranolazine action
Macrolides (clarithromycin, erythromycin, troleandomycin): increased QTc interval

### Drug/food

Do not use with grapefruit or grapefruit juice

## NURSING CONSIDERATIONS

### Assessment

- Assess cardiac status: B/P, pulse, respiration, ECG; watch for prolongation of QT (in those with CCr 60 ml/min), if BUN and creatinine increase significantly, discontinue product
- **QT prolongation:** ECG for QT prolongation, ejection fraction; assess for chest pain, palpitations, dyspnea, torsades de pointes may occur
- **Angina:** characteristics of pain (intensity, location, duration, alleviating/precipitating factors)
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed, excretion unknown

### Patient/family education

- Teach patient to avoid hazardous activities until stabilized on product, dizziness is no longer a problem
- Advise patient to avoid OTC drugs, grapefruit juice, drugs prolonging QTc (quiNIDine, dofetilide, sotalol, erythromycin, thioridazine, ziprasidone or protease inhibitors, diltiazem, ketoconazole, macrolide antibiotics, verapamil) unless directed by prescriber
- Advise patient to comply in all areas of medical regimen
- Teach patient to notify all health care providers of this product use

• Teach patient not to chew or crush, and to avoid grapefruit juice
• Advise patient to notify prescriber of palpitations, dizziness, fainting, edema, dyspnea
• For acute angina take other products prescribed; this product doesn't decrease acute attack

### Evaluation

**Positive therapeutic outcome**
• Decreased anginal pain, attacks and number of episodes

## rasagiline (Rx)

(ra-sa'ji-leen)
**Azilect**
*Func. class.:* Antiparkinson agent
*Chem. class.:* MAOI, type B

**ACTION:** Inhibits MAO type B at recommended doses; may increase DOPamine levels

**Therapeutic outcome:** Improved symptoms in those with Parkinson's disease

**USES:** Idiopathic Parkinson's disease monotherapy or with levodopa

## CONTRAINDICATIONS

Breastfeeding, hypersensitivity to this product or MAOIs, pheochromocytoma

**Precautions:** Pregnancy, children, psychiatric disorders, severe hepatic disorders

## DOSAGE AND ROUTES

### Idiopathic Parkinson's disease

### Monotherapy

**Adult:** PO 1 mg/day

### Adjunctive therapy

**Adult:** PO 0.5 mg/day, may be increased to 1 mg/day; change of levodopa dose in adjunct therapy; reduced levodopa dose may be needed

### Hepatic dose

**Adult:** PO 0.5 mg in mild hepatic disease

### Concomitant ciprofloxacin, other CYP1A2 inhibitors

**Adult:** PO 0.5 mg; plasma concentrations of rasagiline may double

**Available forms:** Tabs 0.5, 1 mg

### Implementation

• Give with meals to prevent nausea; continuing therapy usually reduces or eliminates nausea; do not give with foods/liquids containing large amounts of tyramine
• Give reduced dose of carbidopa/levodopa cautiously
• **Renal failure:** in dialysis, increase dose slowly

## ADVERSE EFFECTS

### Monotherapy

**CNS:** Drowsiness, hallucinations, depression, headache, malaise, paresthesia, vertigo, syncope
**CV:** Angina, hypertensive crisis (ingestion of tyramine products), orthostatic hypotension
**GI:** *Nausea,* diarrhea, dry mouth, dyspepsia
**GU:** Impotence, decreased libido
**HEMA:** Leukopenia
**INTEG:** Alopecia, skin cancers
**MISC:** Conjunctivitis, fever, flu syndrome, neck pain, allergic reaction, alopecia
**MS:** Arthralgia, arthritis, dyskinesia, falls
**RESP:** Rhinitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Protein binding >88%-94% |
| **Metabolism** | Liver, CYP1A2 |
| **Excretion** | Kidneys, half-life 3 hr |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Ciprofloxacin: increased levels of rasagiline up to twofold
Meperidine: do not give; serious reaction including coma and death may occur

### Drug classifications

Analgesics, sympathomimetics: do not give; serious reaction including coma and death may occur
Antidepressants (tricyclics, SSRIs, SNRIs, mirtazapine, cyclobenzaprine): increased severe CNS toxicity
CYP1A2 inhibitors (atazanavir, mexiletine, taurine): increased levels of rasagiline up to twofold
MAOIs: increased hypertensive crisis

### Drug/herb

St. John's wort, yohimbe: do not give

### Drug/food

Do not use with food/liquids that contain large amounts of tyramine (cured meats cheeses, pickled products)

### Drug/lab test

Increased: LFTs
Decreased: WBCs

## NURSING CONSIDERATIONS

### Assessment

- **Assess for Parkinson's symptoms:** tremor, ataxia, muscle weakness and rigidity; baseline, periodically; assess for increased dyskinesia and postural hypotension if used in combination with levodopa
- Assess mental status: hallucinations, confusion, notify prescriber
- **Serotonin syndrome:** Agitation, coma, tachycardia, hyperreflexia, nausea, vomiting, may be precipitated in those taking SSRIs, SNRIs
- **Assess for hypertensive crisis:** severe headache, blurred vision, seizures, chest pain, difficulty thinking, nausea/vomiting, signs of stroke; any unexplained severe headache should be considered to be hypertensive crisis
- Monitor arterial blood gases (ABGs), CBC with differential, LDH, serum bilirubin, creatinine, electrolytes, uric acid baseline and periodically
- Assess for melanomas frequently, perform periodic skin exams by a dermatologist
- Monitor cardiac status: B/P, ECG; periodically, orthostatic hypotension during first 2 months of treatment
- **Tyramine products:** assess for foods, other medications, may lead to hypertensive crisis (tachycardia, bradycardia, chest pain, nausea, vomiting, sweating, dilated pupils)
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excretion unknown

### Patient/family education

- Advise patient to change position slowly to prevent orthostatic hypotension
- Instruct patient to avoid hazardous activities until stabilized; dizziness can occur
- Advise patient to rinse mouth frequently, use sugarless gum to alleviate dry mouth
- Teach patient to take as prescribed, not to miss dose or double doses; take missed dose as soon as remembered if several hours before next dose
- Teach patient to prevent hypertensive crisis by avoiding tyramine foods >150 mg
- Teach patient to avoid CNS depressants, alcohol
- If drowsiness, daytime sleepiness, or falling asleep occurs, product may need to be discontinued
- Skin should be checked periodically for possible skin cancer

### Evaluation

**Positive therapeutic outcome**

- Improved symptoms in those with Parkinson's disease (decreasing tremors, ataxia, muscle weakness/rigidity)

**⚠ HIGH ALERT**

# rasburicase (Rx)

(rass-burr'i-case)

**Elitek, Fasturtec**

*Func. class.:* Enzyme

*Chem. class.:* Recombinant urate-oxidase enzyme

**ACTION:** Catalyzes enzymatic oxidation of uric acid into an inactive and a soluble metabolite (allantoin)

**Therapeutic outcome:** Decreased uric acid levels

**USES:** To reduce uric acid levels in leukemia, lymphoma, solid tumor malignancies who are receiving chemotherapy

## CONTRAINDICATIONS

Hypersensitivity

**BLACK BOX WARNING:** G6PD deficiency (Mediterranean, African descent), hemolytic reactions, or methemoglobinemia reactions to this product

**Precautions:** Pregnancy, breastfeeding, children <2 yr, anemia, acute bronchospasm, angina, patients of African or Mediterranean ancestry, hypotension

**BLACK BOX WARNING:** Anaphylaxis, interference with uric acid measurements

## DOSAGE AND ROUTES

**Adult/adolescent/child/infant: IV** INF 0.2 mg/kg as a single daily dose × 5 days

**Available forms:** Powder for inj 1.5, 7.5 mg/vial

### Implementation

**Intermittent IV INF route**

- Reconstitute with diluent provided, add 1 ml of diluent/vial, swirl, withdraw amount needed and mix with 0.9% NaCl to final volume of 50 ml, use within 24 hr, give over 30 min, do not use filter, use different line, if not possible flush with ≥15 ml of NaCl before and after use
- Chemotherapy is started 4-24 hr after 1st dose

## ADVERSE EFFECTS

**CNS:** *Headache,* fever

**CV:** Chest pain, hypotension

**GI:** *Nausea, vomiting, anorexia, diarrhea, abdominal pain, constipation, dyspepsia, mucositis*

**HEMA:** Neutropenia with fever, hemolysis, methemoglobinemia

**INTEG:** *Rash*
**MISC:** Edema
**RESP:** Bronchospasm, wheezing, dyspnea
**SYST:** Anaphylaxis, hemolysis, methemoglobinemia, sepsis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Elimination 16-21 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

### Drug/lab

**BLACK BOX WARNING:** Interference: uric acid

## NURSING CONSIDERATIONS

### Assessment

- Monitor blood studies: BUN, serum uric acid, urine CCr, electrolytes, CBC with differential before, during therapy
- Monitor temp q4hr; fever may indicate beginning infection; no rectal temp

**BLACK BOX WARNING:** Assess for anaphylaxis (dyspnea, urticaria, flushing, wheezing, swelling of lips, tongue, throat); have emergency equipment nearby

- Assess for G6PD deficiency, hemolytic reactions, methemoglobinemia; these patients should not be given this agent, screen patients who are higher risk for these disorders
- Assess GI symptoms: frequency of stools, cramping; if severe diarrhea occurs, fluid and electrolytes may need to be given
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk

### Patient/family education

- Advise of reason for therapy, expected results
- Advise to report trouble breathing, jaundice, chest pain

### Evaluation

**Positive therapeutic outcome**

- Decreased uric acid levels in children when antineoplastics causing high uric acid levels are used

**⚠ HIGH ALERT**

# regorafenib

(re'goe-raf'e-nib)

**Stivarga**

*Func. class.:* Antineoplastic biologic response modifier; multikinase inhibitor
*Chem. class.:* Signal transduction inhibitor (STI)

**ACTION:** Inhibits tyrosine kinase in patients with colorectal cancer

**Therapeutic outcome:** Decrease in spread or size of tumor

**USES:** Metastatic colorectal cancer in those who have received fluoropyrimidine, oxaliplatin, irinotecan-based chemotherapy, an anti-VEGF therapy; and an anti-EGFR therapy if *KRAS* wild type

## CONTRAINDICATIONS

Pregnancy

**Precautions:** Breastfeeding, children, geriatric patients, cardiac/renal/hepatic/dental disease, fistula, GI bleeding or perforation, bone marrow suppression, infection, wound dehiscence, thrombocytopenia, neutropenia, immunosuppression

**BLACK BOX WARNING:** Hepatic disease

## DOSAGE AND ROUTES

**Adult:** PO 160 mg/day with a low-fat breakfast × 21 days of a 28-day cycle, cycles may be repeated

**Available forms:** Tabs 40 mg

### Implementation

- Store at 77°F (25°C)
- Give at the same time each day with a low-fat breakfast that contains less than 30% fat such as 2 slices of white toast with 1 TBSP of low-fat margarine and 1 TBSP of jelly, and 8 oz of skim milk; or 1 cup of cereal, 8 oz of skim milk, 1 slice of toast with jam, apple juice, and 1 cup of coffee or tea
- Swallow tablets whole
- If a dose is missed, take as soon as possible that day; do not take 2 doses on the same day
- **Hand–foot skin reaction:**

Reduce to 120 mg (grade 2 palmar–plantar erythrodysesthesia); hold if grade 2 toxicity does not improve in 7 days or recurs; hold for 7 days in grade 3 toxicity; reduce to 80 mg for recurrent grade 2 toxicity; discontinue if 80 mg is not tolerated

R

- **Hypertension:**

Hold in grade 2 hypertension

- Other severe toxicity (except hepatotoxicity)

Hold until toxicity resolves in grade 3 or 4 toxicity; consider the risk/benefits of continuing therapy in grade 4 toxicity, reduce dosage to 120 mg; if grade 3 or 4 toxicity recurs, hold until toxicity resolves, then reduce to 80 mg; discontinue in those who do not tolerate 80-mg dose

### Hepatic dose

Baseline mild (Child-Pugh class A) or moderate (Child-Pugh class B): No change; baseline severe hepatic impairment (Child-Pugh class C): use not recommended

**AST/ALT elevations during therapy:**

For grade 3 AST/AST level elevations, hold dose; if therapy is continued, reduce to 120 mg after levels recover; discontinue in those with AST/ALT > 20 × ULN; AST/ALT > 3 × ULN and bilirubin > 2 × ULN; recurrence of AST/ALT >5 × ULN despite a reduction to 120 mg

## ADVERSE EFFECTS

**CNS:** Headache, tremor
**CV:** Hypertensive crisis, MI
**EENT:** Blurred vision, conjunctivitis
**GI:** Hepatotoxicity, GI hemorrhage, diarrhea, GI perforation, xerostomia
**HEMA:** Neutropenia, thrombocytopenia, bleeding
**INTEG:** Rash, alopecia
**META:** Hypokalemia
**MISC:** Fatigue, decreased weight, hand–foot syndrome, hypothyroidism

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 99% |
| **Metabolism** | by CYP3A4, UGT1A0 |
| **Half-life** | 14–58 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Simvastatin: Increased plasma concentrations of simvastatin

Warfarin: Increased plasma concentration of warfarin; avoid use; use low-molecular-weight anticoagulants instead

### Drug classifications

CYP3A4 inhibitors (ketoconazole, itraconazole, erythromycin, clarithromycin): Increase: regorafenib concentrations

Calcium-channel blockers, ergots: Increased plasma concentrations of each product

CYP3A4 inducers (dexamethasone, phenytoin, carBAMazepine, rifampin, PHENobarbital): Decrease: regorafenib concentrations

### Drug/food

Grapefruit juice; avoid use while taking product: Increased regorafenib effect

### Drug/herb

St. John's wort: Decreased imatinib concentration

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Hepatic disease:** fatal hepatotoxicity can occur; obtain LFTs baseline and at least every 2 wk × 2 mo, then monthly

- **Fatal bleeding:** From GI, respiratory, GU tracts; permanently discontinue in those with severe bleeding
- Assess any wounds for healing, report wound dehiscence, stop medication, notify prescriber
- **Pregnancy:** To identify if patient is pregnant or if pregnancy is planned, identify contraception type in both men and women, do not use in pregnancy, breastfeeding
- **Palmar–plantar erythrodysesthesia (hand–foot syndrome):** More common in those previously treated; reddening swelling, numbness, desquamation on palms, soles
- **GI perforation/fistula:** Discontinue if this occurs, assess for pain in epigastric area, dyspepsia, flatulence, fever, chills
- **Hypertension/hypertensive crisis:** Hypertension usually occurs in the first cycle in those with preexisting hypertension, do not start treatment until B/P is controlled; monitor B/P every wk × 6 wk, then at start of each cycle or more often if needed, temporarily or permanently discontinue for severe uncontrolled hypertension

### Patient/family education

- Teach patient to report adverse reactions immediately: bleeding, rash
- Teach patient the reason for treatment, expected results
- Advise patient that effect on male fertility is unknown
- Teach patient to take at same time of day with low-fat food, do not use grapefruit juice,

take missed dose on same day, do not take multiple doses on the same day, keep in original container
• Teach patient to report immediately hepatic effects (yellowing skin, eyes, nausea, vomiting, dark urine), increase B/P, (severe headache); GI perforation/fistula (dyspepsia, flatulence, fever, chills, epigastric pain)
• **Pregnancy:** Not to use in pregnancy if suspected or if breastfeeding, men and women to use contraception during and for 2 mo after termination of treatment

### Evaluation
**Positive therapeutic outcome**
• Decrease in spread or size of tumor

**⚠ HIGH ALERT**

## repaglinide (Rx)
(re-pag'lih-nide)
**Gluco Norm 🍁, Prandin**
*Func. class.:* Antidiabetic
*Chem. class.:* Meglitinides

**Do not confuse:** Prandin/Avandia

**ACTION:** Causes functioning β-cells in pancreas to release insulin, leading to drop in blood glucose levels; closes ATP-dependent potassium channels in the β-cell membrane; this leads to opening of calcium channels; increased calcium influx induces insulin secretion

**Therapeutic outcome:** Blood glucose controlled

**USES:** Type 2 diabetes mellitus

## CONTRAINDICATIONS
Hypersensitivity to meglitinides, diabetic ketoacidosis, type 1 diabetes

**Precautions:** Pregnancy, breastfeeding, children, geriatric, cardiac disease, severe renal/hepatic disease, thyroid disease, severe hypoglycemic reactions

## DOSAGE AND ROUTES
**Adult:** PO 0.5-4 mg with each meal, max 16 mg/day, adjust at weekly intervals; oral hypoglycemic-naïve patients or those with A1c <8% should start with 0.5 mg with each meal

### Renal/hepatic dose
**Adult:** PO CCr 20-39 ml/min: 0.5 mg/day; titrate upward cautiously

**Available forms:** Tabs 0.5, 1, 2 mg

### Implementation
• 15 min before meals: 2, 3, or 4 ×/day preprandially
• Skip dose if meal is skipped; add dose if meal is added
• Store in airtight container at room temperature
• May be added to metFORMIN for better control

## ADVERSE EFFECTS
**CNS:** *Headache, weakness,* paresthesia
**CV:** Angina
**EENT:** Sinusitis, tinnitus
**ENDO:** Hypoglycemia
**GI:** Nausea, vomiting, diarrhea, constipation, dyspepsia, pancreatitis
**INTEG:** Rash, allergic reactions
**MISC:** Chest pain, UTI, allergy
**MS:** Back pains, arthralgia
**RESP:** URI, sinusitis, rhinitis, bronchitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete |
| **Distribution** | 98% protein binding, crosses placenta |
| **Metabolism** | Liver by CYP3A4 |
| **Excretion** | Urine/feces |
| **Half-life** | 1 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 30 min |
| **Peak** | 1 hr |
| **Duration** | <4 hr |

## INTERACTIONS
### Individual drugs
CarBAMazepine, rifampin: increased repaglinide metabolism
Chloramphenicol, deferasirox, fenofibrate, gemfibrozil, probenecid, simvastatin: increased effect of repaglinide
Erythromycin, ketoconazole, miconazole: decreased repaglinide metabolism
Gemfibrozil, isophane insulin (NPH): Do not use together
Isoniazid, phenobarbital, phenytoin, rifampin: decreased action of repaglinide
Levonorgestrel/ethinyl estradiol: increase in both

### Drug classifications
Antifungals, CYP3A4 inhibitors, macrolides: decreased repaglinide metabolism
Barbiturates, CYP3A4 inducers: increased repaglinide metabolism
β-Adrenergic blockers, coumarins, MAOIs, NSAIDs, salicylates, sulfonamides: increased repaglinide effect

R

Calcium channel blockers, contraceptives (oral), corticosteroids, diuretics (thiazide), estrogens, phenothiazines, sympathomimetics, thyroid preparations: decreased repaglinide effect
CYP3A4, OATP1B1, CYP2C9 inhibitors: increased repaglinide effect

### Drug/herb
Chromium, garlic, horse chestnut: increased antidiabetic effect

### Drug/food
Decreased: repaglinide level; give before meals
Grapefruit juice: decreased repaglinide metabolism

### Drug/lab test
Increased/decreased: glucose

## NURSING CONSIDERATIONS
### Assessment
- Assess for hypoglycemic or hyperglycemic reaction, which can occur soon after meals; dizziness, weakness, headache, tremor, anxiety, tachycardia, hunger, sweating, abdominal pain, monitor A1c, fasting, postprandial glucose during treatment
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, usually insulin is used in pregnancy, do not breastfeed, excretion unknown

### Patient/family education
- Teach patient technique of blood glucose monitoring using blood glucose meter
- Teach patient the symptoms of hypoglycemia and hyperglycemia, what to do about each
- Teach patient that product must be continued on daily basis; explain consequence of discontinuing product abruptly
- Advise patient to avoid OTC medications unless ordered by prescriber, not to use alcohol
- Advise patient that diabetes is a lifelong illness; product will not cure disease
- Advise patient to eat all food included in diet plan to prevent hypoglycemia; that if a meal is omitted, dose should be omitted; to have glucagon emergency kit available; to take repaglinide 15-30 min before meals 2, 3, or 4×/day
- Instruct patient to carry/wear emergency ID for emergency purposes

### Evaluation
**Positive therapeutic outcome**
- Decrease in polyuria, polydipsia, polyphagia; clear sensorium; absence of dizziness; stable gait; blood glucose, A1c improvement

## retapamulin topical
*See Appendix B*

## retinoic acid
*See tretinoin*

## $Rh_o$ (D) immune globulin, standard dose IM
**HyperRHO SD, Rho Gam Ultra Filtered Plus**

## $Rh_o$ (D) immune globulin microdose IM
**HyperRHO S/D mini-Dose, MICRhoGAM Ultra Filtered Plus, mini-Gramulin R**

## $Rh_o$ (D) immune globulin microdose (IM, IV)
**Rhophylac**

## $Rh_o$ (D) immune globulin IV
**Rhophylac, WinRho SDF**

*Func. class.:* Immune globulins

**ACTION:** Suppresses immune nonsensitized $Rh_o$ (D or $D^u$)-negative patients who are exposed to $Rh_o$ (D or $D^u$)-positive blood

**Therapeutic outcome:** Absence of Rh factor and transfusion error

**USES:** Prevention of isoimmunization in Rh-negative women exposed to Rh-positive blood given after abortions, miscarriages, amniocentesis, chronic idiopathic thrombocytopenic purpura (Rhophylac)

## CONTRAINDICATIONS
Previous immunization with this product, $Rh_o$ (D)-positive/$D^u$-positive patient

**BLACK BOX WARNING:** Hemolysis

**Precautions:** Pregnancy

**BLACK BOX WARNING:** Requires a specialized setting

## DOSAGE AND ROUTES
**To reduce risk of Rh isoimmunization antepartum/suppression of Rh isoimmunization postpartum following delivery of full-term infant**

**Adult and adolescent ≥16 yr:** IM ([HyperRHO S/D] [full dose only]) 300 mcg (1500 international units) at 28 wk gestation, repeat within 72 hr of delivery of confirmed Rho(D)-positive infant; a dose is not needed after

delivery, if delivery is within 3 wk of last dose and no fetal maternal hemorrhage of >15 ml of RBC; IM (RhoGam only) 300 mcg (1500 international units) at 26-28 wk gestation, repeat within 72 hr even if status of Rho is unknown or if 72 hr have passed; IM/**IV** (WinRho SDF only) 300 mcg (1500 international units) at 28 wk gestation; if given earlier in pregnancy, give at 12-wk intervals during pregnancy, a 120-mcg (600 international units) dose; IM/**IV** should be given as soon as possible and preferably within 72 hr of delivery of a confirmed Rho(D)-positive infant, and even if status is unknown give up to 28 days after delivery

### Known or suspected massive fetomaternal hemorrhage (>15 ml of fetal RBC or >30 ml of fetal whole blood)

**Adult and adolescent ≥16 yr:** IM ([HyperRHO S/D] [full dose only]) 300 mcg (1500 international units) per every 15 ml of fetal blood cells or 30 ml of whole blood, multiple syringes may be injected IM at the same time in different sites, give within 72 hr of exposure, repeat dose within 72 hr of delivery; IM (RhoGAM only) 300 mcg (1500 international units) for every 15 ml of fetal blood cells or 30 ml of whole blood, give total dose within 72 hr of exposure; IM/**IV** (WinRho SDF only) if large fetomaternal hemorrhage is suspected, give **IV** 9 mcg (45 international units) or IM 12 mcg (60 international units) for every ml of fetal whole blood, give **IV** 600 mcg (3000 international units) q8hr or IM 1200 mcg (6000 international units) q12hr until total dose is given, total dose should be given within 72 hr of exposure

### Threatened abortion at any stage of pregnancy

**Adult and adolescent ≥16 yr:** IM ([HyperRHO S/D] [full dose only]) 300 mcg (1500 international units) as soon as possible; if given 13-18 wk gestation, give another 300 mcg (1500 international units) at 26-28 wk gestation; repeat dose within 72 hr of delivery; IM (RhoGam only) 300 mcg (1500 international units) as soon as possible and within 72 hr; IM/**IV** (Rhophylac only) 300 mcg (1500 international units) as soon as possible and within 72 hr; IM/**IV** (WinRho SDF only) 300 mcg (1500 international units) as soon as possible and within 72 hr, repeat dose at 12-wk intervals during pregnancy and 120 mcg (600 international units) as soon as possible after delivery and within 72 hr

### Following spontaneous abortion, induced termination of pregnancy, or ectopic pregnancy that occurs ≤12 wk gestation

**Adult and adolescent ≥16 yr:** IM (Minidose, HYperRHO Minidose, MICRORhoGAM only) 50 mcg (250 international units) as soon as possible, give within 3 hr of spontaneous or surgical removal, if possible within 72 hr

### Following spontaneous abortion, induced termination of pregnancy, or ruptured tubal pregnancy that occurs ≥13 wk

**Adult and adolescent ≥16 yr:** IM (full dose [HyperRHO S/D] RhoGAM only) 300 mcg (1500 international units) as soon as possible and within 72 hr of event

### Following spontaneous abortion, induced termination of pregnancy, amniocentesis, chorionic villus sampling, abdominal trauma, ruptured tubal pregnancy, or percutaneous umbilical cord sampling up to 34 wk gestation

**Adult and adolescent ≥16 wk:** IM/**IV** (WinRho SDF only) 300 mcg (1500 international units) within 72 hr, repeat at 12-wk intervals during pregnancy, give 120 mcg (600 international units) as soon as possible and preferably within 72 hr of delivery

**Available forms:** Hyper RHO S/D solution for injection 1500 IU/prefilled syringe; MICRhoGAM Ultra Filtered Plus Solution for inj 50 mcg/ml; RhoGam Ultra Filtered Plus Solution for inj 50 mcg; Rhophylac Pre-Filled Syringes Solution for inj 300 mcg/2 ml; WinRho SDF Liquid for inj

### Implementation

- BayRho-D is being changed to HyperRHO S/D
- HyperRHO S/D, MICRhoGAM, RhoGAM are given by IM only; do not give **IV**
- Rhophylac may be given IM or **IV**
- Inspect for particulate matter; do not use if particulate matter is present
- Reconstitution/dilution: no reconstitution or dilution is needed for BayRho-D (HyperRHO S/D), Rhophylac, MICRoGAM, RhoGAM, or the liquid formulation of WinRho SDF

**IM route**

- Use aseptic technique, observe for 20 min after administration
- Bring Rhophylac to room temperature before using
- Inject into the deltoid muscle of upper arm or anterolateral portion of the upper thigh; do not inject into gluteal muscle
- If dose calculated will need multiple vials or syringes, use different sites at the same time

**IV route**
- Use aseptic technique
- WinRhoSDF: remove entire contents of vial to obtain calculated dose; if partial vial contents are required for dosage calculation, withdraw the entire vial contents to ensure correct calculation; inf correct calculated dose over 3-5 min; do not inf with other fluids or products
- Rhophylac: bring to room temperature; inf by slow **IV**; observe for 20 min

## ADVERSE EFFECTS
**CNS:** Lethargy
**CV:** Hypo/hypertension
**INTEG:** Irritation at inj site, fever
**MISC:** Infection, ARDS, anaphylaxis, pulmonary edema, DIC
**MS:** Myalgia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS
### Drug classifications
Live virus vaccines (measles, mumps, rubella): decreased antibody response to vaccine

## NURSING CONSIDERATIONS
### Assessment
- Assess for allergies, reactions to immunizations; previous immunization with this product
- **Intravascular hemolysis:** assess for back pain, chills, hemoglobinuria, renal insufficiency; usually when WinRho SDF is given in those with immune thrombocytopenia purpura
- Obtain type and cross-match of mother's blood and of neonate's cord blood; neonate must be $Rh_o(D)$-positive, mother must be $Rh_o(D)$-negative and $(D^u)$-negative, medication should be given if there is a doubt

### Patient/family education
- Teach patient how product works; that product must be given after subsequent deliveries if subsequent babies are Rh-positive
- **Intravascular hemolysis:** Teach patient to report immediately: shaking, fever, chills, dark urine, swelling of hand or feet, back pain, SOB

### Evaluation
**Positive therapeutic outcome**
- Prevention of $Rh_o(D)$ sensitization in transfusion error
- Prevention of erythroblastosis fetalis in subsequent $Rh_o(D)$-positive neonates

# ribavirin (Rx)
(rye-ba-vye′rin)
**Virazole**
*Func. class.:* Synthetic antiviral
*Chem. class.:* Tricyclic amine

**ACTION:** Prevents replication of DNA and RNA synthesis

**Therapeutic outcome:** Resolution of severe lower respiratory tract infections

**USES:** Severe lower respiratory tract infections in infants and children

**Unlabeled uses:** Influenza A or B (early)

## CONTRAINDICATIONS
Pregnancy, breastfeeding, children <1 yr, hypersensitivity

**Precautions:** Epilepsy, renal/hepatic disease

## DOSAGE AND ROUTES
**Infant and young child:** INH 20 mg/ml × 12-18 hr/day × 3-7 days

**Available forms:** Powder for reconstitution for aerosol 6 g/vial

### Implementation
- Give by the Viratek small particle aerosol generator (SPAG-2), do not use other inhalation equipment
- May be given by an oxygen hood for infants, or a face mask may be attached to the SPAG-2
- Reconstitute 6 g of sterile water for inj or inh, place sol in the Erlenmeyer flask and dilute further to 20 mg/ml

## ADVERSE EFFECTS
**CNS:** Dizziness, faintness
**CV:** Hypotension, cardiac arrest
**EENT:** Eye irritation, conjunctivitis, blurred vision, photosensitivity
**INTEG:** Rash

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Inhalation (systemic) |
| **Distribution** | To respiratory tract |
| **Metabolism** | Liver |
| **Excretion** | Respiratory tract |
| **Half-life** | 9½ hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Inhalation's end |
| **Duration** | Unknown |

## INTERACTIONS

### Individual products

Zidovudine: decreased antiviral action, increased toxicity

### Drug classification

Cardiac glycosides: increased toxicity

## NURSING CONSIDERATIONS

### Assessment

- Assess allergies before initiation of treatment, reaction of each medication; list allergies on chart in bright red letters
- Monitor respiratory status: rate, character, wheezing, tightness in chest
- Obtain C&S test results before starting treatment
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

- Teach patient and parents aspects of product therapy

### Evaluation

**Positive therapeutic outcome**

- Absence of respiratory syncytial virus

# riboflavin (vitamin $B_2$) (OTC)

(rye'bo-flay-vin)

*Func. class.:* Vitamin $B_2$, water soluble

**ACTION:** Needed for respiratory reactions (catalyzes proteins) and for normal vision

**Therapeutic outcome:** Prevention or treatment of riboflavin deficiency

**USES:** Vitamin $B_2$ deficiency or polyneuritis; cheilosis adjunct with thiamine

**Precautions:** Pregnancy

## DOSAGE AND ROUTES

### Deficiency

**Adult:** PO 5-30 mg/day
**Child ≥12 yr:** PO 3-10 mg/day, then 0.6 mg/1000 cal ingested

### RDA

**Adult:** PO (Males) 1.3 mg; (females) 1.1 mg

**Available forms:** Tabs 5, 10, 25, 50, 100, 250 mg

### Implementation

- Give with food for better absorption
- Store in airtight, light-resistant container

## ADVERSE EFFECTS

**GU:** Yellow discoloration of urine (large doses)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (by active transport) |
| **Distribution** | 60% protein bound, widely distributed, crosses placenta |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys (unchanged), excess amounts |
| **Half-life** | 1-1½ hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Alcohol, probenecid: increased riboflavin need
Tetracycline: decreased action of tetracycline

### Drug classifications

Antidepressants (tricyclics), phenothiazines: increased riboflavin need

### Drug/lab test

False increase: urinary catecholamines

## NURSING CONSIDERATIONS

### Assessment

- Assess patient's nutritional status: liver, eggs, dairy products, yeast, whole grain, green vegetables
- Assess for vit $B_2$ deficiency: photophobia, cheilosis, stomatitis, ocular swelling
- **Pregnancy/breastfeeding:** Considered safe in pregnancy, breastfeeding at recommended dietary levels

### Patient/family education

- Inform patient that urine may turn bright yellow
- Instruct patient about needed addition of foods that are rich in riboflavin

### Evaluation

**Positive therapeutic outcome**

- Absence of headache, GI problems, cheilosis, skin lesions, depression, burning itchy eyes, anemia

# rifabutin (Rx)

(riff'a-byoo-tin)

**Mycobutin**

*Func. class.:* Antimycobacterial
*Chem. class.:* Rifamycin S derivative

**Do not confuse:** rifabutin/rifampin/rifapentine

**ACTION:** Inhibits DNA-dependent RNA polymerase in susceptible strains

**Therapeutic outcome:** Antimycobacterial death of *Escherichia coli, Bacillus subtilis;* mechanism of action against *Mycobacterium avium* unknown

**USES:** Prevention of *M. avium* complex (MAC) in patients with advanced HIV infection

**Unlabeled uses:** *Helicobacter pylori* that has not responded to other treatment

## CONTRAINDICATIONS

Hypersensitivity, active TB, WBC $<1000/mm^3$, platelets $<50{,}000/mm^3$

**Precautions:** Pregnancy, breastfeeding, children, hepatic disease, blood dyscrasias

## DOSAGE AND ROUTES

**Adult:** PO 300 mg/day (may take as 150 mg bid); max 600 mg/day

### Renal dose

**Adult:** PO CCr <30 ml/min reduce dose by 50%

**Available forms:** Caps 150 mg

### Implementation

- Give with meals to decrease GI symptoms; better to take on empty stomach 1 hr before or 2 hr after meals; high-fat food slows absorption, may take in 2 divided doses, may open capsule and mix with applesauce if unable to swallow whole
- Give antiemetic if vomiting occurs

## ADVERSE EFFECTS

**CNS:** *Headache,* fatigue, anxiety, confusion, insomnia
**GI:** *Nausea, vomiting, anorexia, diarrhea,* heartburn, hepatitis, discolored saliva, pseudomembranous colitis
**GU:** Discolored urine
**HEMA:** Hemolytic anemia, eosinophilia, thrombocytopenia, leukopenia
**INTEG:** *Rash*
**MISC:** Flulike syndrome, shortness of breath, chest pressure
**MS:** Asthenia, arthralgia, myalgia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver |
| **Excretion** | Kidney |
| **Half-life** | 45 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-3 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Amprenavir, busPIRone, clofibrate, cycloSPORINE, dapsone, delavirdine, disopyramide, doxycycline, efavirenz, fluconazole, indinavir, ketoconazole, losartan, nelfinavir, nevirapine, phenytoin, quiNIDine, saquinavir, theophylline, zidovudine, zolpidem: decreased action of each specific product
Ritonavir: increased rifabutin level

### Drug classifications

Anticoagulants, antidepressants (tricyclics), barbiturates, β-blockers, contraceptives (oral), corticosteroids, estrogens, sulfonylureas: decreased action of each specific product

### Drug/food

High-fat foods: decreased absorption

### Drug/lab test

Interference: folate level, vit $B_{12}$, BSP, gallbladder tests

## NURSING CONSIDERATIONS

### Assessment

- **Assess for active TB:** chest x-ray, sputum culture, blood culture, biopsy of lymph nodes, obtain PPD test; product should be given only for MAC and never for TB
- Monitor CBC for neutropenia, thrombocytopenia, eosinophilia
- **Pseudomembranous colitis:** assess for diarrhea, abdominal pain, fever, fatigue, anorexia; possible anemia, elevated WBC and low serum albumin; stop product and usually give either vancomycin or IV metroNIDAZOLE, report immediately, may occur several weeks after discontinuing treatment

### Patient/family education

- Caution patient that compliance with dosage schedule and duration is necessary
- Instruct patient that scheduled appointments must be kept or relapse may occur
- Instruct patient to notify prescriber if hepatitis, neutropenia, or thrombocytopenia occurs: sore throat, fever, bleeding, bruising, yellow sclera, anorexia, nausea, vomiting, fatigue, weakness; myositis: muscle or bone pain
- **Hepatotoxicity:** Teach patient that decreased appetite, jaundice, dark urine, fatigue may occur

• Advise patient that urine, feces, saliva, sputum, sweat, tears may be colored red-orange; soft contact lenses may become permanently stained
• **Pregnancy/breastfeeding:** Caution patients using oral contraceptives to use a nonhormonal method of birth control because rifabutin may decrease efficiency of oral contraceptives; to notify prescriber if pregnancy is planned or suspected, do not use in pregnancy, breastfeeding

### Evaluation

**Positive therapeutic outcome**
• Decreased symptoms of *M. avium* in patients with HIV

## rifampin (Rx)

(rif′am-pin)
**Rifadin, Rofact** 🍁
*Func. class.:* Antitubercular
*Chem. class.:* Rifamycin B derivative

**Do not confuse:** rifampin/rifabutin/rifaximin

**ACTION:** Inhibits DNA-dependent polymerase, decreases tubercle bacilli replication

**Therapeutic outcome:** Bactericidal against the following organisms: mycobacteria, *Staphylococcus aureus, Haemophilus influenzae, Neisseria meningitidis, Legionella pneumophila*

**USES:** Pulmonary TB, meningococcal carriers (prevention)

## CONTRAINDICATIONS

Hypersensitivity to this product or rifamycins, active *Neisseria meningitidis* infection

**Precautions:** Pregnancy, breastfeeding, children <5 yr, hepatic disease, blood dyscrasias

## DOSAGE AND ROUTES

### Tuberculosis

**Adult:** PO/**IV** max 600 mg/day as single dose 1 hr before or 2 hr after meals, or 10 mg/kg/day 5 days/wk or 2-3 ×/wk
**Child >5 yr:** PO/**IV** 10-20 mg/kg/day as single dose 1 hr before or 2 hr after meals, max 600 mg/day, with other antitubercular products
**6-mo regimen:** 2-mo treatment of isoniazid, rifampin, pyrazinamide, and possibly streptomycin or ethambutol; then rifampin and isoniazid × 4 mo
**9-mo regimen:** Rifampin and isoniazid supplemented with pyrazinamide or streptomycin or ethambutol

### Meningococcal carriers

**Adult:** PO/**IV** 600 mg bid × 2 days, max 600 mg/dose
**Child >5 yr:** PO/**IV** 10-20 mg/kg bid × 2 days, max 600 mg/dose
**Infant 3 mo-1 yr:** PO 5 mg/kg bid for 2 days

**Available forms:** Caps 150, 300 mg; powder for inj 600 mg/vial

### Implementation

• Do not give IM or SUBCUT

**PO route**
• On empty stomach, 1 hr before or 2 hr after meals with a full glass of water; give with other products for TB
• Antiemetic if vomiting occurs
• Capsules may be opened and mixed with applesauce or gelatin

**Intermittent IV INF route**
• After diluting each 600 mg/10 ml of sterile water for inj (60 mg/ml), swirl, withdraw dose, and dilute in 100 ml or 500 ml of $D_5W$ given as an inf over 3 hr, or if diluted in 100 ml, give over ½ hr; do not admix with other sol or medications

**Y-site compatibilities:** Amiodarone, bumetanide, midazolam, pantoprazole, vancomycin

## ADVERSE EFFECTS

**CNS:** Headache, fatigue, anxiety, drowsiness, confusion
**EENT:** Visual disturbances
**GI:** *Nausea, vomiting, anorexia, diarrhea,* pseudomembranous colitis, *heartburn,* sore mouth and tongue, pancreatitis, elevated liver function tests
**GU:** Hematuria, acute renal failure, hemoglobinuria
**HEMA:** Hemolytic anemia, eosinophilia, thrombocytopenia, leukopenia
**INTEG:** Rash, pruritus, urticaria
**MISC:** Flulike syndrome, menstrual disturbances, edema, SOB, Stevens-Johnson syndrome, toxic epidermal necrolysis, angioedema, anaphylaxis
**MS:** Ataxia, weakness

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO), completely absorbed (**IV**) |
| **Distribution** | Widely distributed, crosses placenta |
| **Metabolism** | Liver—extensively |
| **Excretion** | Feces |
| **Half-life** | 1-5 hr |

R

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | Rapid | Rapid |
| **Peak** | 2-3 hr | Inf end |
| **Duration** | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Acetaminophen, alcohol, chloramphenicol, clofibrate, cycloSPORINE, dapsone, digoxin, diltiazem, doxycycline, haloperidol, NIFEdipine, phenytoin, theophylline, verapamil, zidovudine: decreased effect of specific product

Isoniazid: increased hepatotoxicity, alcohol, ketoconazole, pyrazinamide

### Drug classifications

Anticoagulants, antidiabetics, barbiturates, benzodiazepines, β-blockers, contraceptives (oral), glucocorticoids, hormones, imidazole antifungals: decreased effect of each product

Protease inhibitors: do not use together

### Drug/lab test

Increased: alk phosphatase, ALT, AST, uric acid, bilirubin, eosinophils

Increased: LFTs

Decreased: Hgb

Interference: folate level, vit $B_{12}$

## NURSING CONSIDERATIONS

### Assessment

- Monitor liver function tests qmo: ALT, AST, bilirubin, decreased appetite, jaundice, dark urine, fatigue
- Monitor renal status: before, qmo: BUN, creatinine, output, specific gravity, urinalysis
- **Pseudomembranous colitis:** assess for diarrhea, abdominal pain, fever, fatigue, anorexia; possible anemia, elevated WBC and low serum albumin; stop product and usually give either vancomycin or IV metroNIDAZOLE
- Monitor mental status often: affect, mood, behavioral changes; psychosis may occur
- **Infection:** assess sputum culture, lung sounds, susceptibility tests baseline and periodically to determine effectiveness and resistance
- C&S should be performed before beginning treatment, during, and after therapy is completed
- **Serious skin reactions:** assess for fever, sore throat, fatigue, ulcers, lesions in mouth, lips, rash; can be fatal
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed, excreted in breast milk

### Patient/family education

- Instruct patient that compliance with dosage schedule, duration is necessary
- Instruct patient that scheduled appointments must be kept or relapse may occur
- Instruct patient to notify prescriber if hepatitis, neutropenia, or thrombocytopenia occurs: sore throat, fever, bleeding, bruising, yellow sclera, anorexia, nausea, vomiting, fatigue, weakness, diarrhea with pus, mucus, blood
- Advise patient that urine, feces, saliva, sputum, sweat, tears may be colored red-orange; soft contact lenses may be permanently stained
- Caution patients using oral contraceptives to use a nonhormonal method of birth control because rifabutin may decrease the efficiency of oral contraceptives, to notify prescriber if pregnancy is planned or suspected
- Advise patient to avoid alcohol; hepatotoxicity may occur

### Evaluation

**Positive therapeutic outcome**

- Decreased symptoms of TB

## rifaximin (Rx)

(rif-ax′i-min)

**Xifaxan**

*Func. class.:* Misc. antiinfective

*Chem. class.:* Analog of rifampin

**Do not confuse:** rifaximin/rifampin

**ACTION:** Binds to bacterial DNA dependent RNA polymerase, thereby inhibiting bacterial RNA synthesis

**Therapeutic outcome:** Bacterial action against *E. coli*

**USES:** Traveler's diarrhea in those ≥12 yr old, caused by *E. coli*, hepatic encephalopathy, irritable bowel syndrome

## CONTRAINDICATIONS

Hypersensitivity to this product or rifamycins, diarrhea with fever, blood in stool

**Precautions:** Pregnancy, breastfeeding, children, geriatric patients

## DOSAGE AND ROUTES

### Traveler's diarrhea

**Adult and child ≥12 yr:** PO 200 mg tid × 3 days without regard to meals

### Hepatic encephalopathy

**Adult:** PO 550 mg bid

**Available forms:** Tabs 200, 550 mg

### Implementation
- May be administered without regard to food

## ADVERSE EFFECTS
**CNS:** Abnormal dreams, dizziness, insomnia, *headache,* fatigue, depression
**CV:** Hypotension, chest pain, peripheral edema, ascites
**GI:** *Abdominal pain, constipation, defecation urgency, flatulence, nausea, rectal tenesmus,* vomiting, ascites, pseudomembranous colitis
**GU:** Proteinuria, polyuria, increased urinary frequency
**MISC:** *Pyrexia,* motion sickness, tinnitus, rash, photosensitivity, exfoliative dermatitis
**MS:** Arthralgia, muscle pain, myalgia
**RESP:** Dyspnea, cough, pharyngitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Low, systemic |
| **Distribution** | Unknown |
| **Metabolism** | Induces CYP3A4 |
| **Excretion** | Feces |
| **Half-life** | 6 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-4 hr |
| **Duration** | Unknown |

## INTERACTIONS
### Individual drugs
Afatinib: increased effect of afatinib

### Drug/lab test
Increased: LFTs, potassium
Decreased: blood glucose, sodium

## NURSING CONSIDERATIONS
### Assessment
- Assess for GI symptoms: amount and character of diarrhea, abdominal pain, nausea, vomiting; do not use in those with blood in stool, increased temperature with diarrhea
- Assess for overgrowth of infection and pseudomembranous colitis
- **Pregnancy/breastfeeding:** Do not use in first trimester, use only if benefits outweigh fetal risk, do not breastfeed, excretion unknown

### Patient/family education
- Instruct patient to discontinue rifaximin and notify prescriber if diarrhea persists for more than 24-48 hr, if diarrhea worsens, or if blood is in stools and fever is present
- Advise patient to avoid hazardous activities if dizziness occurs
- Teach patient to take without regard to food
- Teach patient to take as directed, to consume all of the product prescribed

### Evaluation
**Positive therapeutic outcome**
- Absence of infection

# rilpivirine
(ril-pi-vir′ine)
**Edurant**
*Func. class.:* Antiretroviral
*Chem. class.:* Non-nucleoside transcriptase inhibitors (NNTIs)

**ACTION:** Inhibits HIV-1 reverse transcriptase; unlike nucleoside reverse transcriptase inhibitors (NRTIs), it does not compete for binding nor does it require phosphorylation to be active. Binds directly to a site on reverse transcriptase; causing disruption of the enzyme's active site thereby blocking RNA-dependent and DNA-dependent DNA polymerase activities

**Uses:** HIV in combination with other antiretrovirals

## CONTRAINDICATIONS
Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, immune reconstitution syndrome, antimicrobial resistance, pancreatitis, depression, suicidal ideation, neonates, infants, children, adolescents <18 yr, QT prolongation, torsades de pointes, hyperlipidemia, hypertriglyceridemia, hypercholesterolemia

## DOSAGE AND ROUTES
**Treatment of antiretroviral treatment-naive adults with human immunodeficiency virus (HIV) in combination with other antiretroviral agents**
**Adult/child ≥12 yr and ≥35 kg:** PO 25 mg/day with a meal, if using with rifabutin also, increase rilpivirine dose to 50 mg qday; give with other antiretroviral agents.

**Available forms:** Tab 25 mg

### Implementation
- Store at room temperature away from heat and moisture

## ADVERSE EFFECTS
**CNS:** Depressed mood, dizziness, drowsiness, dysphoria, fatigue, headache, major depression, mood alteration, negative thoughts, suicide attempts

**GI:** Abdominal pain, cholecystitis, cholelithiasis, decreased appetite, diarrhea, elevated hepatic enzymes, hyperbilirubinemia, hypercholesterolemia, nausea, vomiting
**GU:** Glomerulonephritis membranous/glomerulonephritis mesangioproliferative
**INTEG:** Drug reaction with eosinophilia and systemic symptoms (DRESS)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Increased effect 40% (food), decreased effect 50% (high protein drink) |
| **Distribution** | Protein binding (99.7%) to albumin |
| **Metabolism** | Via oxidation CYP3A system |
| **Excretion** | Feces 25% excreted unchanged (85%); urine (6.1%) |
| **Half-life** | Terminal elimination 50 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 4-5 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Aminoglutethimide, bexarotene, bosentan, efavirenz, flutamide, griseofulvin, metyrapone, modafinil, nafcillin, nevirapine, pioglitazone, primidone, ritonavir, topiramate: Decreased rilpivirine effect, treatment failure
Abarelix, alfuzosin, amiodarone, amoxapine, apomorphine, artemether, asenapine, chloroquine, ciprofloxacin, citalopram, cloZAPine, cyclobenzaprine, dasatinib, dolasetron, dronedarone, droperidol, eribulin, flecainide, fluconazole, gatifloxacin, gemifloxacin, haloperidol, iloperidone, lapatinib, levofloxacin, lopinavir, lumefantrine, maprotiline, mefloquine, moxifloxacin, nilotinib, norfloxacin, octreotide, ofloxacin, OLANZapine, ondansetron, paliperidone, palonosetron, pentamidine, posaconazole, QUEtiapine, ranolazine, saquinavir: Increased QT prolongation
Fluconazole, voriconazole: Increased rilpivirine adverse reactions, fungal infections

### Drug classifications

CYP3A4 inducers (phenytoin, fosphenytoin, barbiturates, OXcarbazepine, carBAMazepine, rifabutin, rifampin, rifapentine, dexamethasone), proton pump inhibitors (PPIs): Decreased rilpivirine effect, treatment failure
$H_2$ receptor antagonists (cimetidine, famotidine, nizatidine, ranitidine): Decreased rilpivirine effect, treatment failure; give 12 hr before or 4 hr after rilpivirine
Antacids: Decreased rilpivirine effect; use 2 hr or more before, or 4 hr after rilpivirine
CYP3A4 inhibitors (aldesleukin, amiodarone, aprepitant, atazanavir, basiliximab, boceprevir, bromocriptine, chloramphenicol, clarithromycin, conivaptan, dalfopristin, danazol, darunavir, dasatinib, delavirdine, diltiazem, dronedarone, efavirenz, erythromycin, ethinyl estradiol, fluconazole, FLUoxetine, fluvoxaMINE, fosamprenavir, fosaprepitant, IL-2, imatinib, indinavir, isoniazid, itraconazole, ketoconazole, lanreotide, lapatinib, miconazole, nefazodone, nelfinavir, niCARdipine, octreotide, posaconazole, quiNINE, ranolazine, rifaximin, tamoxifen, telaprevir, telithromycin, tipranavir, troleandomycin, verapamil, voriconazole, zafirlukast): Increased rilpivirine effect
Class IA/III antidysrhythmics, some phenothiazines, beta agonists, local anesthetics, tricyclics, CYP3A4 inhibitors (amiodarone, arsenic trioxide, clarithromycin, erythromycin, levomethadyl, telithromycin, troleandomycin); CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone), halogenated anesthetics: Increased QT prolongation

### Drug/food

Increased adverse reactions: grapefruit juice

## NURSING CONSIDERATIONS

### Assessment

- **HIV:** Assess symptoms of HIV, including opportunistic infections before and during treatment; some may be life-threatening; monitor plasma HIV RNA, CD4+, CD8+ cell counts, serum β-2 microglobulin, serum ICD+24 antigen levels; treatment failures occur more frequently in those with baseline HIV-1 RNA concs >100,000 copies/ml than in patients with concs <100,000 copies/ml; monitor serum cholesterol, lipid panel, assess for redistribution of body fat
- Antiretroviral drug resistance testing before initiation of therapy in antiretroviral treatment-naive patients
- For adults and adolescents, initiation of antiretroviral therapy is recommended in any patient with a history of an AIDS-defining infection; with a CD4 ≤500/$mm^3$; who is pregnant; who has HIV-associated nephropathy; or who is being treated for hepatitis B (HBV) infection

- **DRESS:** May occur 2-8 wk, skin eruptions, eosinophilia, lymphadenopathy, fever, inflammation of internal organs, if these occur, report immediately, usually systemic steroids are given
- **Suicidal thoughts/behaviors:** Assess frequently for suicidal ideation; report any increase in depressive symptoms
- **Renal disease:** Monitor those with severe renal impairment baseline and periodically
- **Hepatic disease:** monitor for elevated hepatic enzymes (>2.5 × ULN); grade 3 and 4 may be higher in patients co-infected with hepatitis B or C
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, enroll pregnant patient in the Antiretroviral Pregnancy Registry 800-258-4263, do not breastfeed, excretion unknown

### Patient/family education

- Teach patient that product is not a cure but controls symptoms, that continuing use is required
- Teach patient that product must be taken in combination with other prescribed products, that if dose is missed, not to take if next dose is within 12 hr, to discuss all products taken including OTC, Rx, herbals, supplements, as there are many interactions
- Teach patient to advise prescriber of all products that are used
- Advise patient to report immediately mood changes and depression immediately
- Teach patient to report if pregnancy is suspected immediately, do not breastfeed
- Teach patient to report hypersensitivity reactions

### Evaluation

**Positive therapeutic outcome**

- Control of HIV-related symptoms

**RARELY USED**

## riluzole (Rx)

(ri-loo'zole)
**Rilutek**
*Func. class.:* Amyotropic lateral sclerosis (ALS) agent
*Chem. class.:* Benzathiazole

**Therapeutic outcome:** Decreased symptoms of ALS

**USES:** ALS

## CONTRAINDICATIONS

Hypersensitivity

## DOSAGE AND ROUTES

**Adult:** PO 50 mg q12hr; take 1 hr before or 2 hr after meals

## risedronate (Rx)

(rih-sed'roh-nate)
**Actonel, Actonel DR, Atelvia**
*Func. class.:* Bone resorption inhibitor
*Chem. class.:* Bisphosphonate

**Do not confuse:** Actonel/Actos

**ACTION:** Inhibits bone resorption; absorbs calcium phosphate crystal in bone and may directly block dissolution of hydroxyapatite crystals of bone

**Therapeutic outcome:** Increased bone mass, activity without fractures

**USES:** Paget's disease; prevention, treatment of osteoporosis in postmenopausal women; glucocorticoid-induced osteoporosis; osteoporosis in men

## CONTRAINDICATIONS

Hypersensitivity to bisphosphonates, inability to stand or sit upright for ≥30 min, esophageal stricture, achalasia, hypocalcemia

**Precautions:** Pregnancy, breastfeeding, children, renal disease, active upper GI disorders, dental disease, hyperparathyroidism, infection, vitamin D deficiency, coagulopathy, chemotherapy, asthma

## DOSAGE AND ROUTES

### Paget's disease (Actonel)

**Adult:** PO 30 mg/day × 2 mo; give calcium and vit D if dietary intake is lacking; if relapse occurs, retreatment is advised

### Treatment/prevention of postmenopausal osteoporosis

**Adult:** PO 5 mg/day or 35 mg qwk or 75 mg/day × 2 consecutive days 2 × mo or 150 mg qmo

### Glucocorticoid osteoporosis

**Adult:** PO 5 mg/day

### Osteoporosis in men

**Adult:** PO 35 mg qwk

### Renal dose

**Adult:** PO CCr <30 mg/min, avoid use

**Available forms:** Tabs 5, 30, 35, 75, 150 mg; tab, weekly 35 mg

### Implementation

- Give PO for 2 mo to be effective in Paget's disease

R

• Give with a full glass of water; patient should be in upright position, give delayed release tablet in AM after breakfast, only use with food (delayed release)
• Administer supplemental calcium and vit D in Paget's disease
• Give daily ≥30 min before meals
• Store in cool environment out of direct sunlight

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, depression, *asthenia, dizziness, insomnia, weakness*
**CV:** Chest pain, hypertension, atrial fibrillation
**GI:** *Abdominal pain,* diarrhea, *nausea,* constipation, esophagitis
**MS:** *Severe muscle/joint/bone pain,* osteonecrosis of the jaw, fractures
**MISC:** Rash, UTI, pharyngitis, hypocalcemia, hypophosphatemia, increased PTH
**SYST:** Angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | To bones (50%) |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys |
| **Half-life** | Terminal 23 hr<br>↑ determined by poor metabolizers or average metabolizers |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Drug classifications

Aluminum, antacids, calcium, iron, magnesium salts: decreased absorption of risedronate
NSAIDs, salicylates: increased GI irritation
$H_2$ antagonists, proton pump inhibitors: decreases absorption of delayed release risedronate; do not use together

### Drug/food

Food: decreased bioavailability; take ½ hr before food or drinks other than water

### Drug/lab test

Decreased: calcium, phosphorus

## NURSING CONSIDERATIONS

### Assessment

• **Paget's disease:** assess for headache, bone pain, increased head circumference
• **Osteoporosis:** in men or postmenopausal women; bone density study prior to and periodically during treatment
• **Hypocalcemia:** assess for paresthesia, twitching, laryngospasm, Chvostek's/Trousseau's signs
• **Serious skin reactions:** assess for angioedema
• Assess for atrial fibrillation
• Monitor phosphate, alkaline phosphatase, calcium; creatinine, BUN (renal disease)
• **Hypercalcemia:** assess for paresthesia, twitching, laryngospasm, Chvostek's/Trousseau's signs
• Assess dental health, cover with antiinfectives prior to dental extraction
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed, excretion unknown
• **Beers:** Avoid use in older adults except for schizophrenia, bipolar disorder, or as a short-term antiemetic in chemotherapy

### Patient/family education

• Advise patient to sit upright for ½ hr after dose to prevent irritation
• Teach patient to notify prescriber immediately if difficulty swallowing, severe heartburn, or pain in chest
• Instruct patient to comply with dietary restrictions, maintain good oral hygiene
• Advise patient to notify prescriber if pregnancy is planned or suspected

### Evaluation

**Positive therapeutic outcome**
• Increased bone mass, absence of fractures

## risperiDONE (Rx)

(res-pare'a-done)
**RisperDAL, Risperdal Consta, Risperdal M-TAB**
*Func. class.:* Antipsychotic
*Chem. class.:* Benzisoxazole derivative

**Do not confuse:** RisperDAL/reserpine

**ACTION:** Unknown; may be mediated through both DOPamine type 2 ($D_2$) and serotonin type 2 ($5\text{-}HT_2$) antagonism

**Therapeutic outcome:** Decreased hallucinations and disorganized thought

**USES:** Irritability associated with autism, bipolar disorder, mania, schizophrenia

## CONTRAINDICATIONS

Hypersensitivity, seizure

**Precautions:** Pregnancy, children, geriatric, cardiac/renal/hepatic disease, breast cancer,

Parkinson's disease, CNS depression, brain tumor, dehydration, diabetes, hematologic disease, seizure disorders, breastfeeding, abrupt discontinuation, suicidal ideation, phenylketonuria

**BLACK BOX WARNING:** Increased mortality in elderly patients with dementia-related psychosis

## DOSAGE AND ROUTES

**Adult:** PO 2 mg/day as a single dose or 2 divided doses, adjust dose at intervals of ≥24 hr and 1-2 mg/day as tolerated to 4-8 mg/day; IM establish dosing with PO prior to IM 25 mg q2wk, may increase to max 50 mg q2wk

**Adolescent:** PO 0.5 mg/day in AM or PM, adjust dose at intervals of ≥24 hr and 0.5-1 mg/day as tolerated to 3 mg/day

**Geriatric:** PO 0.5 mg daily-bid, increase by 1 mg qwk; IM 25 mg q2wk

### Hepatic dose/renal dose

**Adult:** PO 0.5 mg, increase by 0.5 mg bid, then increase to 1.5 mg bid at intervals ≥1 wk

**Available forms:** Tabs 0.25, 0.5, 1, 2, 3, 4 mg; oral sol 1 mg/ml; orally disintegrating tabs 0.25, 0.5, 1, 2, 3, 4 mg; long-acting inj kit (Risperdal Consta) 12.5, 25, 37.5, 50 mg

### Implementation

**PO route**

- Reduced dosage in geriatric patients
- Anticholinergic agent on order from prescriber, to be used for EPS
- Avoid use with CNS depressants
- Conventional tabs: give without regard to meals
- **Oral disintegrating tab** (Risperdal M-Tab): do not open blister pack until ready to use; tear 1 of the 4 units apart at perforation; bend corner where indicated; peel back foil; do not push tab through foil; remove from pack and place on tongue; tab disintegrates in seconds and can be swallowed with or without liquids, do not split or chew
- **Oral solution:** may dilute 3-4 oz of a beverage, measure dose using calibrated pipette, not compatible with tea, cola; compatible with water, coffee, orange juice, low-fat milk

**IM route**

- Only suspend in the diluent provided and with the supplied needle; prior to admixing, allow to come to room temperature for 30 minutes prior to reconstitution
- Remove colored cap from the vial without removing rubber stopper. Wipe top of the grey stopper with an alcohol wipe
- Peel back the blister pouch and remove the Vial Access Device by holding between the white luer cap and the skirt. Do not touch the spike tip at any time
- Place the vial on a hard surface and hold the base. Orient the Vial Access Device vertically over the vial so that the spike tip is at the center of the vial's rubber stopper
- With a straight downward push, press the spike tip of the Vial Access Device through the center of the vial's rubber stopper until the device securely snaps onto the vial top
- Hold the base of the vial and swab the syringe connection point (blue circle) of the Vial Access Device with an alcohol wipe and allow to dry prior to attaching the syringe
- Avoid over-tightening, or syringe component parts may loosen from the syringe body
- While holding the white collar of the syringe, insert and press the syringe tip into the blue circle of the Vial Access Device and twist. Hold the skirt of the Vial Access Device during attachment to prevent it from spinning. Keep the syringe and the Vial Access Device aligned
- Inject the entire contents of the syringe containing the diluent into the vial
- Shake the vial vigorously for a minimum of 10 seconds while holding the plunger rod down with the thumb. Mixing is complete when the suspension appears uniform, thick, and milky colored, and all the powder is dispersed in liquid. The microspheres will be visible in liquid, but no dry microspheres remain
- Invert the vial completely and slowly withdraw the entire content of the suspension from the vial into the syringe. Tear the section of the vial label at the perforation and apply the detached label to the syringe for identification purposes
- While holding the white collar of the syringe, unscrew the syringe from the Vial Access Device, then discard both the vial and the Vial Access Device appropriately
- Select the appropriate color-coded needle provided with the kit. Two distinct needles are provided. The needle with the yellow colored hub and print is for injection into the gluteal muscle (2-inch needle) and the needle with the green colored hub and print is for deltoid muscles (1-inch needle). They are not interchangeable; do not use the needle intended for gluteal injection for deltoid injection, and vice versa
- Peel the blister pouch of the Needle-Pro safety device open halfway. Grasp the transparent needle sheath using the plastic peel pouch. To prevent contamination, do not touch the orange Needle-Pro safety device's luer connector. While holding the white collar of the syringe, attach the luer connection of the orange Needle-Pro safety device to the syringe with an easy clockwise twisting motion

• While holding the white collar of the syringe, grasp the transparent needle sheath and seat the needle firmly on the orange Needle-Pro safety device with a push and a clockwise twist. Seating the needle will secure the connection between the needle and the orange Needle-Pro safety device
• While holding the white collar of the syringe, pull the transparent needle sheath straight away from the needle. Do not twist the sheath since this may loosen the luer connection
• Re-suspension will be necessary prior to administration, since settling will occur after reconstitution. Re-suspend the microspheres in the syringe by shaking vigorously
• May refer to the Instructions for Use section of the product labeling for detailed visual aids that accompany the written instructions

**Administration**

• **Only for IM; do not give IV**
• Re-suspension will be necessary prior to administration, since settling will occur after reconstitution. Re-suspend the microspheres in the syringe by shaking vigorously
• Remove any air bubbles by tapping the syringe and slowly depressing the plunger with the needle in an upright position
• Inject the entire contents of the syringe into the upper outer quadrant of the gluteal area or the deltoid muscle of the arm; inject immediately after reconstitution to avoid settling. Gluteal injections should be alternated between the two buttocks
• After the injection is complete, press the needle into the orange Needle-Pro safety device by gently pressing the orange Needle-Pro safety device against a flat surface with one hand. As the orange Needle-Pro safety device is pressed, the needle will firmly engage into the orange Needle-Pro safety device
• Visually confirm engagement of the needle into the Needle-Pro safety device, appropriately discard the used and unused needle provided in the dose pack
• Do not store the vial after reconstitution or the suspension may settle
• Do not combine 2 different dosage strengths of Risperdal Consta in a single administration
• The dose pack device is for single use only. Do not re-process for subsequent re-use because the integrity of the device may be compromised leading to a deterioration in performance
• *Stability after reconstitution:* Once in suspension, the product may remain at room temperature use within 6 hr. Always re-suspend prior to administration if not used immediately
• When switching from oral to inj, give oral dose with first inj and continue for 3 wk, then discontinue

## ADVERSE EFFECTS

**CNS:** *EPS (pseudoparkinsonism, akathisia, dystonia, tardive dyskinesia), drowsiness, insomnia, agitation, anxiety, headache,* neuroleptic malignant syndrome, dizziness, seizures, suicidal ideation, head titubation (shaking)
**CV:** Orthostatic hypotension, tachycardia, heart failure, sudden death (geriatric), AV block
**EENT:** Blurred vision, tinnitus
**GI:** *Nausea,* vomiting, *anorexia, constipation,* jaundice, weight gain
**GU:** Hyperprolactinemia, gynecomastia, dysuria
**HEMA:** Neutropenia, granulocytopenia
**MS:** Rhabdomyolysis
**MISC:** Renal artery disease; weight gain, hyperprolactinemia (child)
**RESP:** Rhinitis, sinusitis, upper respiratory infection, cough

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver, extensively |
| **Excretion** | Urine 90% |
| **Half-life** | 3-24 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-2 hr |
| **Duration** | Up to 12 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased sedation
• Chloroquine, clarithromycin, droperidol, erythromycin, haloperidol, methadone, pentamidine, thioridazine, ziprasidone: increased QT prolongation
CarBAMazepine: increased risperiDONE excretion
Furosemide: increased risk of death in dementia-related psychosis
Levodopa: decreased levodopa effect
TraMADol: increased seizures
Valproic acid, verapamil: increased risperiDONE levels

### Drug classifications

Acetylcholinesterase inhibitors, CYP2D6 inhibitors, SSRIs: increased risperiDONE levels
Antipsychotics: increased EPS
β-agonists, class IA/III antidysrhythmics, local anesthetics, some phenothiazines, tricyclics: increased QT prolongation
CNS depressants: increased sedation

CYP2D6 inducers (carBAMazepine, barbiturates, phenytoin, rifampin): decreased risperiDONE action
CYP2D6 inhibitors (selective serotonin reuptake inhibitors): serotonin syndrome, neuroleptic malignant syndrome

### Drug/herb
Echinacea: decreased risperiDONE effect

### Drug/lab test
Increased: prolactin levels, blood glucose, lipids

## NURSING CONSIDERATIONS

### Assessment
- Suicidal thoughts, behaviors often occur when depression is lessened; assess mental status: orientation, mood, behavior, presence and type of hallucinations before initial administration, monthly; this product should significantly reduce psychotic behavior
- Monitor thyroid function test, blood glucose, serum electrolytes/prolactin/lipid profile, bilirubin, creatinine, weight, pregnancy test, CBC, LFTs, AIMS assessment, and weight baseline periodically
- Assess affect, orientation, LOC, reflexes, gait, coordination, sleep pattern disturbances
- **QT prolongation:** Monitor B/P with patient in sitting, standing, and lying positions; take pulse and respirations q4hr during initial treatment; establish baseline before starting treatment; report drops of 30 mm Hg; obtain baseline ECG and monitor Q- and T-wave changes
- Check for dizziness, faintness, palpitations, tachycardia on rising; severe orthostatic hypotension is common
- **Assess for neuroleptic malignant syndrome:** hyperpyrexia, muscle rigidity, increased CPK, altered mental status; product should be discontinued
- **EPS:** Assess for akathisia (inability to sit still, no pattern to movements), tardive dyskinesia (bizarre movements of the jaw, mouth, tongue, extremities), pseudoparkinsonism (rigidity, tremors, pill rolling, shuffling gait); an antiparkinsonian product should be prescribed
- Assess for constipation, urinary retention daily; if these occur, increase bulk, water in diet
- Assess for weight gain, hyperglycemia, metabolic changes in diabetes, increased lipids
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, EPS may occur in the neonate, enroll pregnant patient in the National Pregnancy Registry for Atypical Antipsychotics 866-961-2388, do not breastfeed, excreted in breast milk
- **Beers:** Avoid use in older adults except for schizophrenia, bipolar disorder, or as a short-term antiemetic in chemotherapy

### Patient/family education
- Teach patient to use good oral hygiene; frequent rinsing of mouth, sugarless gum for dry mouth
- Caution patient to avoid hazardous activities until product response is determined; dizziness, blurred vision may occur
- Inform patient that orthostatic hypotension occurs often; patient should rise from sitting or lying position gradually and remain lying down for at least 30 min after IM inj
- Instruct patient to avoid hot tubs, hot showers, tub baths; hypotension may occur
- Inform patient that heat stroke may occur in hot weather and to take extra precautions to stay cool
- Advise patient to avoid abrupt withdrawal of this product, or EPS may result; product should be withdrawn slowly
- Teach patient to avoid OTC preparations (cough, hay fever, cold) unless approved by prescriber; serious product interactions may occur; avoid use with alcohol, CNS depressants because increased drowsiness may occur
- Advise patient to use contraception, to inform prescriber if pregnancy is planned or suspected
- Teach patient to notify provider of suicidal thoughts/behaviors

### Evaluation
**Positive therapeutic outcome**
- Decrease in emotional excitement, hallucinations, delusions, paranoia
- Reorganization of patterns of thought, speech

## TREATMENT OF OVERDOSE:
Lavage, provide airway

## ritonavir (Rx)
(ri-toe′na-veer)
**Norvir**
*Func. class.:* Antiretroviral
*Chem. class.:* Protease inhibitor

**Do not confuse:** ritonavir/retrovir

**ACTION:** Inhibits HIV-1 protease and prevents maturation of the infectious virus

**Therapeutic outcome:** Improvement of HIV-1 infection

**USES:** HIV-1 in combination with at least 2 other antiretrovirals

## CONTRAINDICATIONS
Hypersensitivity

**BLACK BOX WARNING:** Coadministration with other drugs

**Precautions:** Pregnancy, breastfeeding, children, liver disease, pancreatitis, diabetes, hemophilia, AV block, hypercholesterolemia, immune reconstitution syndrome, neonates, cardiomyopathy, immune reconstitution syndrome

## DOSAGE AND ROUTES

**Adult/adolescent >16 yr:** PO 600 mg bid; if nausea occurs, begin dose at ½ and gradually increase, max 1200 mg/day in divided doses
**Adolescent ≤16 yr/child/infant:** PO 400 mg/m$^2$ bid up to 1200 mg/day in divided doses; may start lower and escalate

**Available forms:** Caps 100 mg; oral sol 80 mg/ml, tab 100 mg

### Implementation

- Oral sol: Shake oral sol well, use calibrated measuring device
- Store caps in refrigerator
- Mix liquid formulation with chocolate milk or liquid nutritional supplement to improve taste
- When switching from cap to tab, more GI symptoms may occur that will lessen over time
- Use dosage titration to minimize side effects
- Overdose: infants, children 43.2% alcohol, 26.57% propylene glycol oral solution, calculate total amount of alcohol, propylene glycol from all products given

## ADVERSE EFFECTS

**CNS:** *Paresthesia,* headache, seizures, dizziness, insomnia, fever, asthenia, intracranial bleeding
**CV:** QT, PR interval prolongation
**GI:** *Diarrhea,* buccal mucosa ulceration, *abdominal pain, nausea, taste perversion,* dry mouth, *vomiting, anorexia,* pancreatitis, pseudomembranous colitis, hepatitis
**HEMA:** leukopenia, thrombocytopenia
**INTEG:** Rash
**MISC:** Asthenia, angioedema, anaphylaxis, Stevens-Johnson syndrome, increased lipids, lipodystrophy, toxic epidermal necrolysis, immune reconstitution syndrome
**MS:** Pain, rhabdomyolysis, myalgia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well |
| **Distribution** | Unknown |
| **Metabolism** | 98% protein binding, liver |
| **Excretion** | Unknown |
| **Half-life** | 3-5 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

**BLACK BOX WARNING:** Amiodarone, astemizole, buPROPion, cisapride, cloZAPine, desipramine, encainide, ergotamine, flecainide, meperidine, midazolam, pimozide, piroxicam, propafenone, propoxyphene, quiNIDine, ranolazine, saquinavir, terfenadine, triazolam, zolpidem: toxicity, do not use together

Atovaquone, divalproex, ethinyl estradiol, lamoTRIgine, phenytoin, sulfamethoxazole, theophylline, voriconazole, zidovudine: decreased levels of each drug
Bosentan: increased levels of bosentan
Clarithromycin: increased level of both products
ddI: increased levels of both products
Fluconazole: increased ritonavir level

**BLACK BOX WARNING:** Haloperidol, chloroquine, droperidol, pentamidine, arsenic trioxide, levomethadyl: increased QT prolongation

Nevirapine, phenytoin: decreased ritonavir levels

### Drug classifications

Anticoagulants: decreased levels of anticoagulants
Azole antifungals, benzodiazepines, HMG-CoA reductase inhibitors, interleukins: toxicity, do not use together
Barbiturates, rifamycins: decreased ritonavir level

**BLACK BOX WARNING:** Class IA/III antidysrhythmics, some phenothiazines, β-agonists, local anesthetics, tricyclics, CYP3A4 inhibitors (amiodarone, clarithromycin, erythromycin, telithromycin, troleandomycin), CYP3A4 substrates (dasatinib, methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone): increased QT prolongation

CYP2D6 inhibitors: toxicity, do not use together

### Drug/herb

Red yeast rice: avoid use
St. John's wort: decreased ritonavir levels, avoid concurrent use

### Drug/lab test

Increased: ALT, GGT, AST, CK, cholesterol, triglycerides, uric acid
Decreased: Hct, RBC, Hgb, neutrophils, WBC

## NURSING CONSIDERATIONS

### Assessment

- **QT prolongation:** ECG for QT prolongation, ejection fraction; assess for chest pain, palpitations, dyspnea
- **Rhabdomyolysis:** muscle pain, increased CPK, weakness, swelling of affected muscles, dark urine; if these occur and if confirmed by CPK, product should be discontinued
- **Immune reconstitution syndrome:** may occur with combination therapy, may develop inflammatory response with opportunistic infection (MAC, Graves disease, Guillain-Barré syndrome, TB, PCP), may occur during initial treatment or months afterward
- Assess signs of infection, anemia
- Monitor viral load and CD4, blood glucose, plasma HIV RNA, serum cholesterol, lipid profile baseline, throughout therapy
- Resistance testing prior to starting therapy and after treatment failure
- Assess liver function tests: ALT, AST; in those with hepatic disease, monitor q3mo
- Monitor C&S before product therapy; product may be taken as soon as culture is done; repeat C&S after treatment; determine the presence of other STDs
- Assess bowel pattern before, during treatment; if severe abdominal pain with bleeding occurs, product should be discontinued; monitor hydration
- **Serious skin disorders:** Stevens-Johnson syndrome, angioedema; anaphylaxis, toxic epidermal necrolysis
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, enroll pregnant patient in the Antiretroviral Pregnancy Registry 800-258-4263, do not breastfeed

### Patient/family education

- Teach patient to take as prescribed; if dose is missed, take as soon as remembered up to 1 hr before next dose; do not double dose
- Teach patient that product must be taken in equal intervals around the clock to maintain blood levels for duration of therapy
- Teach patient that product is not a cure for HIV; opportunistic infections may continue to be acquired, and others may continue to contract HIV from the patient

**BLACK BOX WARNING:** Advise patient to avoid other Rx, OTC meds, herbs, supplements unless approved by prescriber, not to use St. John's wort, that it decreases this product's effect

- Inform that redistribution of body fat or accumulation of body fat may occur

### Evaluation

**Positive therapeutic outcome**

- Decreasing symptoms of HIV
- Improving viral load and CD4 cell counts

**⚠ HIGH ALERT**

## riTUXimab (Rx)

(rih-tuks'ih-mab)

**Rituxan**

*Func. class.:* Antineoplastic—miscellaneous; DMARD

*Chem. class.:* Murine/human monoclonal antibody

**ACTION:** Directed against the CD20 antigen that is found on malignant B lymphocytes; CD20 regulates a portion of cell cycle initiation/differentiation

**Therapeutic outcome:** Decreased tumor size, prevention of spread of cancer

**USES:** Non-Hodgkin's lymphoma (CD20 positive, B-cell), bulky disease (tumors >10 cm), rheumatoid arthritis, Wegener's granulomatosis, microscopic polyangiitis

## CONTRAINDICATIONS

Hypersensitivity, murine proteins

**Precautions:** Pregnancy, breastfeeding, children, geriatric, cardiac/renal/pulmonary conditions

**BLACK BOX WARNING:** Exfoliative dermatitis, infusion-related reactions, progressive multifocal leukoencephalopathy, hepatitis B exacerbation

## DOSAGE AND ROUTES

### Relapsed or refractory low-grade or follicular, CD20 positive, B-cell non-Hodgkin's lymphoma (NHL)

**Adult: IV** 375 mg/m$^2$ qwk × 4 doses, may retreat with 4 more doses of 375 mg/m$^2$ qwk

### First-line treatment of follicular, CD20-positive, B-cell non-Hodgkin's lymphoma (NHL), in combination with chemotherapy

**Adult: IV** 375 mg/m$^2$ on day 1 of each cycle for up to 8; may be given with cyclophosphamide **IV** 750 mg/m$^2$ on day 1, vinCRIStine **IV** 1.4 mg/m$^2$ (max of 2 mg) on day 1, and predniSONE 40 mg/m$^2$/day PO on days 1-5

### Single-agent maintenance therapy in patients with follicular, CD20-positive, B-cell non-Hodgkin's lymphoma (NHL) (complete or partial response following first-line treatment with riTUXimab in combination with chemotherapy)

**Adult: IV** 375 mg/m$^2$ **IV** q8wk × 12 doses as maintenance therapy starting 8 wk after the completion of induction chemotherapy with 8 doses of riTUXimab with 6-8 cycles of cyclophosphamide, vinCRIStine, and predniSONE 4-6 cycles of cyclophosphamide, DOXOrubicin, vinCRIStine, and predniSONE

### As a component of the Zevalin (ibritumomab tiuxetan) regimen

**Adult: IV;** as a required component of the ibritumomab regimen; riTUXimab 250 mg/m$^2$ given within 4 hr prior to the administration of Yttrium-90 ibritumomab that may occur on day 7, 8, or 9

### First-line treatment of diffuse large B-cell, CD20-positive non-Hodgkin's lymphoma (NHL), in combination with CHOP or other anthracycline-based chemotherapy regimen

**Adult 18-59 yr: IV** 375 mg/m$^2$ on day 1 of each cycle for up to 8 infusions

### As single-agent maintenance therapy in patients with low-grade, CD20-positive, B-cell non-Hodgkin's lymphoma (NHL) with nonprogressing disease (stable disease or better) following first-line treatment with cyclophosphamide, vinCRIStine, and predniSONE (CVP)

**Adult: IV** 375 mg/m$^2$ qwk × 4 wk repeated q6mo × 2 years (total of 16 doses) as maintenance therapy starting 4 wk after the completion of first-line chemotherapy with 6 to 8 cycles of cyclophosphamide, vinCRIStine, and predniSONE (CVP)

**Available forms:** Inj 10 mg/ml (100 mg/10 ml, 500 mg/50 ml)

### Implementation

**Intermittent IV infusion route**

- Hold antihypertensive 2 hr before administration
- Administer after diluting to a final conc of 1-4 mg/ml; use 0.9% NaCl, $D_5W$, gently invert bag to mix; do not mix with other products
- Increase fluid intake to 2-3 L/day to prevent dehydration, unless contraindicated
- Store vials at 36° F-40° F; protect vials from direct sunlight; inf sol is stable at 36° F-46° F for 24 hr and at room temp for another 12 hr

**Y-site compatibilities:** Acyclovir, amifostine, amikacin, aminophylline, ampicillin, ampicillin/sulbactam, aztreonam, bleomycin, bumetanide, buprenorphine, busulfan, butorphanol, calcium gluconate, CARBOplatin, carmustine, cefAZolin, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chlorproMAZINE, cimetidine, CISplatin, clindamycin, cyclophosphamide, cytarabine, DACTINomycin, DAUNOrubicin hydrochloride, dexamethasone, dexrazoxane, digoxin, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, DOXOrubicin liposome, doxycycline, droperidol, enalaprilat, etoposide phosphate, famotidine, fentaNYL, filgrastim, floxuridine, fluconazole, fludarabine, fluorouracil, ganciclovir, gemcitabine, gentamicin, granisetron, haloperidol, heparin, hydrocortisone, HYDROmorphone, IDArubicin, ifosfamide, imipenem/cilastatin, irinotecan, leucovorin, levorphanol, LORazepam, magnesium sulfate, mannitol, meperidine, mesna, methotrexate, methylPREDNISolone, metoclopramide, metroNIDAZOLE, mitoMYcin, mitoXANtrone, morphine, nalbuphine, netilmicin, PACLitaxel, pentamidine, piperacillin/tazobactam, plicamycin, potassium chloride, prochlorperazine, promethazine, ranitidine, sargramostim, streptozocin, teniposide, theophylline, thiotepa, ticarcillin/clavulanate, tobramycin, trimethoprim/sulfamethoxazole, trimethobenzamide, vinBLAStine, vinCRIStine, vinorelbine, zidovudine

**Y-site incompatibilities:** Aldesleukin, amphotericin B colloidal, ciprofloxacin, cycloSPORINE, DAUNOrubicin liposome, DOXOrubicin hydrochloride, furosemide, levofloxacin, minocycline, ondansetron, quinupristin/dalfopristin, sodium bicarbonate, topotecan, vancomycin

**Additive incompatibilities:** Do not admix with other products

## ADVERSE EFFECTS

**CNS:** Life-threatening brain infection (progressive multifocal leukoencephalopathy)
**CV:** Cardiac dysrhythmias, heart failure, MI, superventricular tachycardia, hypertension, angina
**GI:** *Nausea, vomiting, anorexia,* GI obstruction/perforation
**GU:** Renal failure
**HEMA:** Leukopenia, neutropenia, thrombocytopenia, anemia
**INTEG:** *Irritation at inj site, rash,* fatal mucocutaneous infections (rare)

**MISC:** *Fever,* chills, asthenia, *headache,* angioedema, hypotension, myalgia, bronchospasm, ARDs
**SYST:** Stevens-Johnson syndrome, exfoliative dermatitis, toxic epidermal necrolysis, tumor lysis syndrome
**META:** Hyperkalemia, hypocalcemia, hyperphosphatemia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Binds to CD20 sites on lymphoma cells |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Varies |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

CISplatin: increased nephrotoxicity—avoid concurrent use; if used, monitor renal status

### Drug classifications

Anticoagulants, NSAIDs: increased bleeding risk
Antihypertensives: increased hypotension, separate by 12 hr

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Assess for signs of fatal inf reaction: hypoxia, pulmonary infiltrates, ARDS, MI, ventricular fibrillation, cardiogenic shock; most fatal inf reactions occur with first inf, discontinue product

**BLACK BOX WARNING:** Hepatitis B exacerbation or fulminant hepatitis, hepatic failure, death may occur during or after treatment, screen all patients for HBV (HBsAg and HBc titers) before use, monitor those with current or prior HBV for signs of hepatitis or HBV reactivation for several months after therapy, if reactivation occurs, discontinue product

**BLACK BOX WARNING:** Assess for signs of severe mucocutaneous reactions: Stevens-Johnson syndrome, lichenoid dermatitis, toxic epidermal lysis; signs occur 1-13 wk after product was given, discontinue treatment immediately

**BLACK BOX WARNING:** Assess for tumor lysis syndrome: acute renal failure requiring hemodialysis, hyperkalemia, hypocalcemia, hyperuricemia, hyperphosphatasemia; allopurinol and adequate hydration may be needed

**BLACK BOX WARNING: Multifocal leukoencephalopathy:** confusion, dizziness, lethargy, hemiparesis, monitor periodically

- Monitor CBC, differential, platelet count weekly; withhold product if WBC is <3500/mm³ or platelet count <100,000/mm³; notify prescriber of these results; product should be discontinued
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, contraception should be used, enroll pregnant patient in the Mother To Baby Autoimmune Diseases Study 877-311-8972 (patients with rheumatoid arthritis) do not breastfeed, excretion unknown
- Monitor ECG, serum creatinine/BUN, electrolytes, uric acid; correct electrolyte imbalances before use, hyperkalemia, hypocalcemia, hyperphosphatemia occur often
- Assess GI symptoms: frequency of stools, abdominal pain, perforation/obstruction may occur
- **Infection:** assess for fever, increased temperature, flulike symptoms in those with WG and MPA, in those using DMARDs

### Patient/family education

- Advise patient to report to prescriber possible infection (cough, fever, chills, sore throat), renal issues (painful urination, back/side pain), bleeding (gums, stools, bruising, urine, emesis, fatigue), chest pain
- Advise to avoid OTC products
- Teach to use contraception during and up to 12 mo after therapy
- Avoid use with vaccines, toxoids
- Advise patient to increase fluid intake

### Evaluation

**Positive therapeutic outcome**

- Prevention of increasing cancer progression

**⚠ HIGH ALERT**

## rivaroxaban

(ri-va-rox'a-ban)
**Xarelto**
*Func. class.:* Anticoagulant
*Chem. class.:* Factor Xa inhibitor

**ACTION:** A novel, oral anticoagulant that selectively and potently inhibits coagulation factor Xa

**Therapeutic outcome:** Prevention of DVT, stroke, and systemic embolism

## USES:

For deep venous thrombosis (DVT) prophylaxis, pulmonary embolism (PE), in patients undergoing knee or hip replacement surgery; for stroke prophylaxis and systemic embolism prophylaxis in patients with nonvalvular atrial fibrillation

## CONTRAINDICATIONS

Severe hypersensitivity

**Precautions:** Moderate or severe hepatic disease (Child-Pugh Class B or C), hepatic disease associated with coagulopathy, creatinine clearance <30 ml/min for use as DVT prophylaxis and <15 ml/min for stroke and systemic embolism prophylaxis in nonvalvular atrial fibrillation, dental procedures, neonates, infants, children, adolescents, pregnancy aneurysm, diabetes retinopathy, breastfeeding, diverticulitis, endocarditis, geriatrics, GI bleeding, hypertension, obstetric delivery, peptic ulcer disease, stroke, surgery

## DOSAGE AND ROUTES

### Deep venous thrombosis (DVT) prophylaxis, which may lead to pulmonary embolism (PE) (knee or hip replacement surgery)

Administer the initial dose at least 6–10 hr after surgery once hemostasis has been established

**Adult: PO** 10 mg daily for 12 days after knee replacement surgery or for 35 days after hip replacement

### Stroke prophylaxis and systemic embolism prophylaxis (nonvalvular atrial fibrillation)

**Adult: PO** 20 mg daily with the evening meal (CrCl > 50 ml/min); **converting from warfarin to rivaroxaban:** discontinue warfarin and start rivaroxaban when INR is <3; **converting from another anticoagulant other than warfarin to rivaroxaban:** start rivaroxaban 0-2 hr before the next scheduled evening administration of anticoagulant (omit that dose of anticoagulant); for continuous infusion of unfractionated heparin, stop the infusion and initiate rivaroxaban simultaneously; **converting from rivaroxaban to another anticoagulant with rapid onset (not warfarin):** Discontinue rivaroxaban and give the first dose of the other anticoagulant (oral or parenteral) at the time that the next dose of rivaroxaban would have been administered

### Renal dose

**Adult:** PO (nonvalvular atrial fibrillation) CCr 15-50 ml/min, 15 mg/day; CCr <15 ml/min, avoid use; (treatment/prophylaxis of DVT/pulmonary embolism) CCr <30 ml/min, avoid use

### Hepatic dose

**Adult:** PO Child-Pugh class B or C: avoid use

**Available forms:** Tab 10, 15, 20, 50 mg

### Implementation

- **For DVT prophylaxis:** give daily without regard to food, give initial dose ≥6-10 hr after surgery when hemostasis has been established
- **For stroke/systemic embolism prophylaxis:** give daily with evening meal
- If dose is not given at correct time, give as soon as possible on the same day
- Unless pathological bleeding occurs, do not discontinue rivaroxaban in the absence of alternative
- Store at room temperature
- 15, 20 mg tablets should be taken with food, for those unable to swallow whole, 15 mg and 20 mg tablets may be crushed, mixed with applesauce, immediately following administration, instruct to eat, crushed tablets are stable in applesauce for up to 4 hr
- 10 mg tablet can be taken without regard to food

**Nasogastric (NG) tube or gastric feeding tube**

- Confirm gastric placement of tube
- Crush 15 mg or 20 mg tablet, suspend in 50 ml of water, and administer via NG or gastric feeding tube
- To minimize reduced absorption, avoid administration distal to the stomach
- Enteral feeding should immediately follow administration of a crushed dose
- Crushed tablets are stable in water for up to 4 hours

**Missed doses**

- Patients receiving 15 mg twice daily should take their missed dose immediately to ensure intake of 30 mg per day. Two 15-mg tablets may be taken at once followed by the regular 15 mg twice daily dose the next day
- For patients receiving once daily dosing, take the missed dose as soon as it is remembered

## ADVERSE EFFECTS

**GI:** Cholestasis, cytolytic hepatitis, hyperbilirubinemia, increased hepatic enzymes, jaundice, nausea

**HEMA:** Adrenal bleeding, bleeding, cerebral hemorrhage, epidural hematoma, GI bleeding, hemiparesis, intracranial bleeding, retinal hemorrhage, retroperitoneal hemorrhage, subdural hematoma, thrombocytopenia
**INTEG:** Anaphylactic reaction, anaphylactic shock, blister, hypersensitivity, pruritus
**SYST:** Stevens-Johnson syndrome

**BLACK BOX WARNING:** Active bleeding

**BLACK BOX WARNING:** Abrupt discontinuation, epidermal/spinal anesthesia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 80%-100% |
| **Distribution** | Protein binding (92%-95%) |
| **Metabolism** | Oxidative degradation |
| **Excretion** | Urine (66%), feces (17%) |
| **Half-life** | 5-9 hr; geriatric: 11-13 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-4 hrs |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Clarithromycin, conivaptan, erythromycin, itraconazole, ketoconazole, lopinavir/ritonavir, nicardipine: increased rivaroxaban effect, possible bleeding
CarBAMazepine, phenytoin, rifampin, ritonavir: decreased rivaroxaban effect
Amiodarone, azithromycin, darunavir, diltiazem, dronedarone, felodipine, fluconazole, lapatinib, mifepristone, nelfinavir, pantoprazole, posaconazole, quiNIDine, ranolazine, saquinavir, tamoxifen, telithromycin, verapamil: increased rivaroxaban effect in renal impairment

### Drug classifications

NSAIDs, other anticoagulants, platelet inhibitors, salicylates, thrombolytics: increased rivaroxaban effect, possible bleeding

### Drug/herb

St. John's wort: decreased rivaroxaban effect

### Drug/food

Grapefruit juice: increased rivaroxaban effect in renal disease
Food: decreased rivaroxaban effect

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Bleeding:** Monitor for bleeding, including bleeding during dental procedures, easy bruising, blood in urine, stools, emesis, sputum, epistaxis; there is no specific antidote

**BLACK BOX WARNING: Abrupt discontinuation:** Avoid the abrupt discontinuation unless an alternative anticoagulant is used in those with atrial fibrillation; discontinuing puts patients at increased risk for thrombotic events; if this product must be discontinued for reasons other than pathological bleeding, consider administering another anticoagulant

- **Pregnancy/breastfeeding:** pregnancy; identify if pregnancy is suspected or planned; pregnancy-related hemorrhage may occur, and anticoagulation cannot be monitored with standard laboratory testing; breastfeeding should be discontinued prior to use of this product, use only if benefits outweigh fetal risk

**BLACK BOX WARNING: Epidural/spinal anesthesia:** Epidural or spinal hematomas that may result in long-term/permanent paralysis may occur in patients who have received anticoagulants and are receiving neuraxial anesthesia or undergoing spinal puncture. The epidural catheter should not be removed <18 hr after the last dose of rivaroxaban; do not administer the next rivaroxaban dose <6 hr after the catheter removal; delay rivaroxaban administration for 24 hr if traumatic puncture occurs. Monitor for neuro changes

- **Hepatic/Renal disease:** Increase in effect of this product in hepatic disease (Child-Pugh Class B or C), hepatic disease with coagulopathy; renal failure/severe renal impairment (creatinine clearance <30 ml/min in DVT prophylaxis and <15 ml/min for stroke/systemic embolism prophylaxis in nonvalvular atrial fibrillation); product should be discontinued in acute renal failure; reduce dose in those with atrial fibrillation and CrCl 15-50 ml/min; monitor renal function periodically (creatinine clearance, BUN)
- **Beers:** Avoid use in older adults with CCr <30 ml/min, reduce dose in CCr 30-50 ml/min

### Patient/family education

- Advise patient to report numbness of extremities, weakness, tingling, contact

R

prescriber immediately (neuraxial anesthesia, spinal puncture)
• Advise patient to report if pregnancy is planned or suspected, not to breastfeed
• Teach patient to report bleeding (bruising, blood in urine, stools, sputum, emesis, heavy menstrual flow) and to use soft toothbrush, electric shaver
• Advise patient to inform all health care providers of use; report to prescriber all products used, to take all medication for duration, exactly as prescribed, to prevent clots, notify prescriber if unable to so a different anticoagulant may be used
• Advise patient to avoid abrupt discontinuation without another blood thinner
• Instruct patients, especially those with dental disease, in proper oral hygiene, including caution in use of regular toothbrushes, dental floss, and toothpicks.

### Evaluation

**Positive therapeutic outcome**
• Prevention of DVT, stroke and systemic embolism

## rivastigmine (Rx)

(riv-as-tig′mine)
**Exelon, Exelon Patch**
*Func. class.:* Anti-Alzheimer's agent
*Chem. class.:* Cholinesterase inhibitor

**ACTION:** Potent selective inhibitor of brain acetylcholinesterase (AChE) and butyrylcholinesterase (BChE)

**Therapeutic outcome:** Decreased signs and symptoms of Alzheimer's dementia

**USES:** Mild to severe Alzheimer's dementia, mild to moderate Parkinson's disease dementia (PDD)

## CONTRAINDICATIONS

Hypersensitivity to this product, other carbamates

**Precautions:** Pregnancy, breastfeeding, children, renal/hepatic/respiratory disease, seizure disorder, asthma, urinary obstruction, peptic ulcer, increased intracranial pressure, surgery, GI bleeding, jaundice

## DOSAGE AND ROUTES

**Adult:** PO 1.5 mg bid with food for 4 wk or more, may increase to 3 mg bid after 4 wk or more; may increase to 4.5 mg bid and thereafter 6 mg bid, max 12 mg/day; transdermal apply 4.6 mg/24 hr after 4 wk or more, may increase to 9.5 mg/24 hr; max 13.3 mg/24 hr; for those using 6-12 mg/day PO and switching to transdermal use one 9.5 mg/24 hr; for those using <6 mg/day PO and switching to transdermal use one 4.6 mg/24 hr

**Available forms:** Caps 1.5, 3, 4.5, 6 mg; transdermal patch 4.6, 9.5 mg/24 hr

### Implementation

• Give with meals; take with AM and PM meal even though absorption may be decreased
• Provide assistance with ambulation during beginning therapy
• Discontinue treatment for several doses and restart at same or next lower dosage level if adverse reactions cause intolerance
• If treatment is interrupted for longer than several days treatment should be initiated with the lowest daily dose and titrated as indicated above

**Transdermal route**
• Apply to clean, hairless, dry skin; not in an area that clothing will rub; rotate sites daily; remove liner; apply firmly; may be used during water activities; avoid saunas, avoid excess sunlight or external heat, each 5 $cm^2$ patch contains 9 mg base, rate of 4.6 mg/24 hr, each 10 $cm^2$ patch is 18 mg base, rate of 9.5 mg/24 hr

## ADVERSE EFFECTS

**CNS:** *Tremors, confusion, insomnia,* psychosis, hallucination, depression, dizziness, headache, anxiety, somnolence, fatigue, syncope, EPS, exacerbation of Parkinson's disease
**CV:** QT prolongation, AV block, cardiac arrest, MI, angina, palpitations, bradycardia
**GI:** *Nausea, vomiting, anorexia, abdominal distress, flatulence,* diarrhea, constipation, dyspepsia, colitis, eructation, fecal incontinence, GI bleeding/obstruction, GERD, gastritis, pancreatitis
**MISC:** UTI, asthenia, increased sweating, hypertension, flulike symptoms, weight change

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly, completely absorbed |
| **Distribution** | 40% protein binding |
| **Metabolism** | To decarbamylated metabolite |
| **Excretion** | Kidney—metabolites, clearance lowered in geriatric, hepatic disease, increased nicotine use |
| **Half-life** | 1½ hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Nicotine: increased metabolism, decreased blood level of rivastigmine

### Drug classifications

Anticholinergics, phenothiazines, sedating $H_1$ blockers, tricyclics: decreased rivastigmine effect
Cholinergic agonists, other cholinesterase inhibitors: increased synergistic effect
NSAIDs: increased GI effects

## NURSING CONSIDERATIONS

### Assessment

- Monitor liver function tests: AST, ALT, alkaline phosphatase, LDH, bilirubin, CBC
- Assess for severe GI effects: nausea, vomiting, anorexia, weight loss, GI bleeding
- Monitor B/P, respiration during initial treatment; hypo/hypertension should be reported
- **Cognitive/mental status:** affect, mood, behavioral changes, depression; complete suicide assessment
- **Pregnancy/breastfeeding:** Use only if clearly needed, do not breastfeed, excretion unknown
- **Beers:** Avoid use in older adults, increased risk of orthostatic hypotension or bradycardia

### Patient/family education

- Teach patient procedure for giving **oral sol**; use instruction sheet provided; teach application of **transdermal** product, to fold in half and discard, not to get in eyes, to wash hands after application, to not use heating pad, sauna, tanning bed
- Teach patient to notify prescriber of severe GI effects, do not discontinue abruptly
- Teach patient that product may cause dizziness, anorexia, weight loss

### Evaluation

#### Positive therapeutic outcome

- Increased coherence, decreased symptoms of Alzheimer's disease, improved mood
- Teach patient to give with food in AM, PM
- Teach patient to report nausea, vomiting, diarrhea
- Advise to inform prescriber of all products taken

## rizatriptan (Rx)

(rye-zah-trip'tan)
**Maxalt, Maxalt-MLT**
*Func. class.:* Migraine agent
*Chem. class.:* 5-$HT_1$-like receptor agonist

**ACTION:** Binds selectively to the vascular 5-$HT_{1B/1D}$ receptor subtype, exerts antimigraine effect; causes vasoconstriction in cranial arteries

**Therapeutic outcome:** After treatment, relief of migraine

**USES:** Acute treatment of migraine

## CONTRAINDICATIONS

Angina pectoris, history of MI, documented silent ischemia, Prinzmetal's angina, ischemic heart disease, concurrent ergotamine-containing preparations, uncontrolled hypertension, hypersensitivity, basilar or hemiplegic migraine

**Precautions:** Pregnancy, breastfeeding, children, postmenopausal women, men >40 yr, geriatric, risk factors for CAD, hypercholesterolemia, obesity, diabetes, impaired renal/hepatic function

## DOSAGE AND ROUTES

**Adult: PO** 5-10 mg single dose, redosing separate by 2 hr or more; max 30 mg/24 hr, use 5 mg in patient on propanolol; max 15 mg/24 hr

**Available forms:** Tabs (Maxalt) 5, 10 mg; orally disintegrating tabs (Maxalt-MLT) 5, 10 mg

### Implementation

- Provide quiet, calm environment with decreased stimulation for noise, bright light, excessive talking
- Do not open blister pack until ready to use, put orally disintegrating tab on tongue to dissolve; swallow with saliva

## ADVERSE EFFECTS

**CNS:** *Dizziness,* drowsiness, *headache, fatigue,* warm/cold sensation, flushing
**CV:** MI, ventricular fibrillation, ventricular tachycardia, coronary artery vasospasm, peripheral vascular ischemia, ECG changes
**ENDO:** Hot flashes, mild increase in growth hormone
**GI:** *Nausea,* dry mouth, diarrhea, abdominal pain, ischemic colitis
**RESP:** Chest tightness, pressure, dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver (metabolite) |
| **Excretion** | Urine/feces |
| **Half-life** | 2-3 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 10 min-2 hr |
| **Peak** | Unknown |
| **Duration** | Unknown |

R

## INTERACTIONS

### Individual drugs

Cimetidine, isocarboxazid, pargyline, phenelzine, propranolol, trancyclomine: increased rizatriptan action
Ergot: increased vasospastic effects
Sibutramine: increased levels of sibutramine

### Drug classifications

Contraceptives (oral), MAOIs, MAOIs (nonselective types A and B): increased rizatriptan action
Ergot derivatives, 5-$HT_1$ receptor agonists: increased vasospastic effects
Selective serotonin reuptake inhibitors: increased weakness, hyperreflexia, incoordination

### Drug/herb

St. John's wort: serotonin syndrome

## NURSING CONSIDERATIONS

### Assessment

- Assess for stress level, activity, recreation, coping mechanisms
- Assess neurologic status: LOC, blurring vision, nausea, vomiting, tingling in extremities preceding headache
- **Ingestion of tyramine-containing foods:** Monitor for pickled products, beer, wine, aged cheese, food additives, preservatives, colorings, artificial sweeteners, chocolate, caffeine, which may precipitate these types of headaches
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, enroll in the registry 800-986-8999, cautious use in breastfeeding, excretion unknown

### Patient/family education

- **Teach patient use of orally disintegrating tab:** instruct patient not to open blister until use, to peel blister open with dry hands, to place tab on tongue, where it will dissolve, and to swallow with saliva (contains phenylalanine)
- Advise patient to report any side effects to prescriber
- Advise patient to use alternative contraception while taking product if oral contraceptives are being used
- Teach patient that product does not prevent or reduce number of migraines, main action is abortive, if first dose does not relieve pain, do not use more, notify prescriber

### Evaluation

#### Positive therapeutic outcome

- Decrease in frequency, severity of headache

## roflumilast

(roe-flue'mi-last)
**Daliresp**
*Func. class.:* Respiratory anti-inflammatory agent
*Chem. class.:* Phosphodiesterase-4 (PDE4) inhibitor

**ACTION:** Roflumilast and the active metabolite (roflumilast N-oxide), selectively inhibit phosphodiesterase-4 (PDE4); not a bronchodilator; instead, inhibition of the PDE4 enzyme blocks the hydrolyses and inactivation of cyclic adenosine monophosphate (cAMP), resulting in intracellular cAMP accumulation; decreases inflammatory activity, PDE4 inhibition may affect migration and actions of pro-inflammatory cells (neutrophils, other leukocytes, T lymphocytes, monocytes, macrophages, fibroblasts)

**Therapeutic outcome:** Decreasing exacerbations in COPD

**USES:** For the prevention of COPD exacerbations in those with severe chronic obstructive pulmonary disease (COPD) associated with chronic bronchitis and a history of exacerbations

## CONTRAINDICATIONS

Moderate to severe hepatic disease (Child-Pugh B or C)

**Precautions:** Pregnancy, breastfeeding, neonates, infants, children, and adolescents, acute bronchospasm, anxiety, insomnia, depression, and/or suicidal ideation or behavior

## DOSAGE AND ROUTES

**Adult: PO** 500 mcg/day

**Available forms:** Tab 500 mcg

### Implementation

#### PO route

- Give without regard to meals
- Store at room temperature

## ADVERSE EFFECTS

**CNS:** Anxiety, depression, dizziness, headache, insomnia, suicidal ideation, tremor
**EENT:** Rhinitis, sinusitis
**GI:** Abdominal pain, anorexia, diarrhea, dyspepsia, gastritis, nausea, vomiting, weight loss
**GU:** Urinary tract infection
**MS:** Back pain, muscle cramps/spasm
**SYST:** Infections, influenza

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 80% |
| **Distribution** | Protein binding 99%, 100% penetration across blood-brain barrier |
| **Metabolism** | Exclusively by CYP3A4, CYP1A2 |
| **Excretion** | 70% urine |
| **Half-life** | 17 hr (parent); 30 hr (metabolite) |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1 hr (parent drug); 8 hrs (metabolite) |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

CYP3A4 inducers (alcohol, barbiturates, bexarotene, bosentan, carBAMazepine, dexamethasone, erythromycin, etravirine, fluvoxaMINE, ketoconazole, metyrapone, modafinil, nevirapine, OXcarbazepine, PHENobarbital, phenytoin, rifabutin, rifampin, ritonavir: decreased roflumilast effect

CYP3A4/CYP1A2 inhibitors (cimetidine, dalfopristin, delavirdine, enoxacin, indinavir, isoniazid, itraconazole, quinupristin, tipranavir): increased roflumilast effect

Oral contraceptives (gestodene and ethinyl estradiol): increased roflumilast effect

Fosamprenavir: altered effect

### Drug/herb

St. John's wort: decreased roflumilast effect

## NURSING CONSIDERATIONS

### Assessment

- Monitor lung sounds and respiratory function baseline and periodically thereafter
- Assess behavioral changes including mood, depression and suicidal thoughts/behaviors
- Monitor liver function tests baseline and periodically thereafter; if increases in liver function studies occur, product should be discontinued
- Monitor weight baseline and periodically, as weight loss is common
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed, excretion in breast milk

### Patient/family education

- Advise patient to take product as directed, do not skip or double doses, take missed doses as soon as remembered unless almost time for next dose
- Teach patient not to use OTC or other products without prescriber approval; not to discontinue other respiratory products unless approved by prescriber
- Advise patient not to be used for acute bronchospasm, but may be continued during acute asthma attacks
- **Suicidal thoughts/behaviors:** Instruct patient to notify prescriber of worsening depression or suicidal thoughts/behaviors

### Evaluation

**Positive therapeutic outcome**

- Decreasing exacerbations in COPD

**RARELY USED**

## romiPLOStim (Rx)

(roe-mi-ploe'stim)

**Nplate**

*Func. class.:* Hematopoietin

*Chem. class.:* Thrombopoietin receptor agonist

**ACTION:** A thrombopoietin-like fusion protein produced by DNA recombinant technology

**Therapeutic outcome:** Increase in platelet counts, absence of bleeding

**USES:** Chronic idiopathic thrombocytopenic purpura in patients who have had an insufficient response to corticosteroids, immunoglobulins, or splenectomy

## CONTRAINDICATIONS

Hypersensitivity to this product or mannitol

**Precautions:** Pregnancy, breastfeeding, malignancies, bleeding, bone marrow suppression, children

## DOSAGE AND ROUTES

### Thrombocytopenia in chronic idiopathic thrombocytopenic purpura (ITP) with insufficient response to corticosteroids, immunoglobulins, splenectomy

**Adult:** SUBCUT; initial dose is 1 mcg/kg SC qwk (based on actual body weight). Increase the weekly dose by 1 mcg/kg until the patient achieves a platelet count $\geq$50,000/mm$^3$; do not exceed a maximum weekly dose of 10 mcg/kg; use the lowest dose needed to achieve and maintain a platelet count $\geq$50,000/mm$^3$; monitor CBC, including platelet counts, qwk until a stable platelet count is achieved; platelets $\geq$50,000/mm$^3$ $\geq$4 wk without dose adjustment; then, monitor the CBC, including platelet counts, monthly. Once a stable dose is achieved, if the

platelet count falls to <50,000/mm$^3$, increase the dose by 1 mcg/kg/wk. If the platelet count increases to >200,000/mm$^3$ for 2 consecutive wk, reduce dose by 1 mcg/kg; if the platelet count is >400,000/mm$^3$, temporarily stop romiplostim, and continue to monitor the platelet count weekly; once the platelets are <200,000/mm$^3$, restart, but reduce the previous dose by 1 mcg/kg/wk. RomiPLOStim may be administered concomitantly with other medical ITP therapies. If platelet counts exceed 50,000/mm$^3$, other medical ITP therapies may be reduced or discontinued. Discontinue romiPLOStim if the platelet count does not increase to avoid important bleeding after 4 wk of therapy at max dose of 10 mcg/kg

**Available forms:** Inj vials 250, 500 mcg

### Implementation

- Store vials in refrigerator, do not freeze; protect from light; diluted sol is stable refrigerated or at room temperature for 24 hrs

**SUBCUT route**

- Use 0.01 ml graduations syringe
- Discard any unused portion in vial; do not pool unused portions from vials
- Dilute 250 mcg/0.72 preservative-free sterile water for inj; 500 mcg/1.2 preservative-free sterile water for inj; final concentration 500 mcg/ml
- Gently swirl until dissolved; do not shake
- Do not use if discolored or if particulate matter is present
- Inj into outer aspect of upper arm or abdomen except for 2 inches around navel or front aspect of middle thigh; do not use areas that are bruised, scratched, or scarred
- Rotate inj sites

## ADVERSE EFFECTS

**CNS:** *Dizziness, insomnia, headache,* fatigue
**GI:** Abdominal pain, dyspepsia, diarrhea
**HEMA:** Thromboembolism, thrombosis, bleeding, myelofibrosis, erythromelalgia
**MS:** Myalgia
**SYST:** Secondary malignancy, antibody formation

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Terminal 1-34 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 7-50 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Anticoagulants, NSAIDs, platelet inhibitors, thrombolytics, salicylates: possible risk of bleeding

## NURSING CONSIDERATIONS

### Assessment

- **Bone marrow suppression:** If cytopenias occur, product should be discontinued; may use a bone marrow biopsy and straining for fibrosis
- **Thromboembolic disease:** Do not use to normalize patients, use only in those with thrombocytopenia in ITP, maintain platelets ≥50,000/mm$^3$
- Assess blood studies: CBC during treatment weekly and for 2 wks after discontinuing

### Patient/family education

- Instruct patient to report bleeding, to avoid hazardous activities that may cause bleeding
- Inform the patient the reason for product and expected results
- Advise patient to report a missed dose to prescriber due to increased risk of bleeding
- Teach patient that lab tests will be done qwk and dose may be changed; if dose is not changed lab will be checked qmo; after drug is discontinued, labs will be checked qwk × 2 wk
- Teach patient to advise prescriber if spleen has been removed: bleeding or clotting problems
- Teach patient to notify prescriber if pregnancy is planned or suspected; if pregnancy occurs, call registry 877-675-2831

### Evaluation

**Positive therapeutic outcome**

- Increase in platelet counts, absence of bleeding

## rOPINIRole (Rx)

(roe-pin'e-role)
**Requip, Requip XL**
*Func. class.:* Antiparkinsonian agent
*Chem. class.:* Dopamine-receptor agonist, nonergot

**Do not confuse:** rOPINIRole/risperiDONE

**ACTION:** Selective agonist for DOPamine $D_2$ receptors (presynaptic/postsynaptic sites); binding at $D_3$ receptor contributes to antiparkinson effects

**Therapeutic outcome:** Decreased symptoms of Parkinson's disease (involuntary movements)

**USES:** Parkinsonism, restless legs syndrome

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, cardiac/renal/hepatic disease, dysrhythmias, affective disorders, psychosis

## DOSAGE AND ROUTES

### Parkinson's disease

**Adult: PO** (regular release) Initially, 0.25 mg PO tid × first wk; gradually titrate at weekly intervals; wk 2: give 0.5 mg tid; wk 3: 0.75 mg tid; wk 4; titrate to 1 mg tid; after wk 4, may increase by 1.5 mg/day wk, max 9 mg/day total dose, and then by 3 mg/day qwk, max 24 mg/day; PO (ext rel) Initially, 2 mg/day × 1-2 wk, may increase by mg/day at intervals ≥1 wk based upon response; max 24 mg/day. If significant interruption of therapy occurs, retitration may be necessary

### For conversion from immediate-release to ext rel tablets

**Oral dosage (ext rel tablets):**

*Adults currently on 0.75-2.25 mg/day:* Give 2 mg/day ext rel

*Adults currently on 3-4.5 mg/day:* Give 4 mg/day ext rel

*Adults currently on 6 mg/day:* Give 6 mg/day ext rel

*Adults currently on 7.5-9 mg/day:* Give 8 mg/day ext rel

*Adults currently on 12 mg/day:* Give 12 mg/day ext rel

*Adults currently on 15-18 mg/day:* Give 16 mg/day ext rel

*Adults currently on 21 mg/day:* Give 20 mg/day ext rel

*Adults currently on 24 mg/day:* Give 24 mg/day ext rel

### For the treatment of restless legs syndrome (RLS)

**Adult:** PO (reg rel) Initially, 0.25 mg/day, give 1-3 hr before bedtime; days 3-7, may increase to 0.5 mg/day; at the beginning of wk 2 (day 8) the dose may be increased to 1 mg/day × 1 wk; weeks 3-6, dose may be titrated up by 0.5 mg/wk (from 1.5-3 mg over the 5-wk period), as needed to achieve desired effect; wk 7, may increase dose to 4 mg/day; dose is titrated based on clinical response; give all doses 1-3 hr before bedtime

**Available forms:** Tabs 0.25, 0.5, 1, 2, 3, 4, 5 mg; ext rel tab 2, 4, 6, 8, 12 mg

### Implementation

- Give product until NPO before surgery
- Adjust dosage to patient's response
- Give with meals to decrease GI upset
- Test for diabetes mellitus, acromegaly if patient is receiving long-term therapy

## ADVERSE EFFECTS

**CNS:** Dystonia, *agitation, insomnia,* dizziness, psychosis, hallucinations, depression, somnolence, sleep attacks, impulse-control disorders
**CV:** *Orthostatic hypotension,* hypotension, syncope, palpitations, tachycardia, hypertension
**EENT:** Blurred vision
**GI:** *Nausea, vomiting, anorexia, dry mouth,* constipation, dyspepsia, flatulence
**GU:** Impotence, urinary frequency
**HEMA:** Hemolytic anemia, leukopenia, agranulocytosis
**INTEG:** Rash, sweating
**RESP:** Pharyngitis, rhinitis, sinusitis, bronchitis, dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver, extensively by the liver by CYP450 CYP1A2 enzyme system |
| **Excretion** | Kidneys |
| **Half-life** | 6 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Cimetidine, ciprofloxacin, digoxin, diltiazem, enoxacin, erythromycin, fluvoxamine, levodopa, mexiletine, norfloxacin, tacrine, theophylline: increased effect of rOPINIRole
Metoclopramide: decreased rOPINIRole effect

### Drug classifications

Butyrophenones, phenothiazines, thioxanthenes: decreased ropinirole effect

## NURSING CONSIDERATIONS

### Assessment

- Monitor B/P, respiration during initial treatment; hypotension or hypertension should be reported

R

• Assess mental status: affect, mood, behavioral changes, depression; complete suicide assessment
• **Parkinsonism:** assess for akinesia, tremors, staggering gait, muscle rigidity, drooling; these symptoms should improve with therapy
• **Sleep attacks:** assess for drowsiness, falling asleep without warning even during hazardous activities
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, avoid breastfeeding, excretion unknown

### Patient/family education
• Teach patient to notify prescriber if pregnancy is planned or suspected, pregnancy, breastfeeding
• Teach patient to take with food to prevent nausea
• Teach patient to report hallucinations, confusion (usually in geriatrics)
• Advise patient that therapeutic effects may take several wk to a few mo
• Caution patient to change positions slowly to prevent orthostatic hypotension
• Instruct patient to use product exactly as prescribed; if product is discontinued abruptly, parkinsonian crisis may occur
• Teach patient that drowsiness, sleeping attacks may occur, to avoid driving or other hazardous activities until response is known
• Teach patient to avoid alcohol and CNS depressants (cough and cold products)
• Teach patient to notify prescriber of unusual urges

### Evaluation
**Positive therapeutic outcome**
• Decreased akathisia, other involuntary movements
• Increased mood

## ropivacaine (Rx)
(roe-pi'va-kane)
**Naropin**
*Func. class.:* Local anesthetic
*Chem. class.:* Amide

**ACTION:** Competes with calcium for sites in nerve membrane that control sodium transport across cell membrane; decreases rise of depolarization phase of action potential

**Therapeutic outcome:** Maintenance of local anesthesia

**USES:** Peripheral nerve block, caudal anesthesia, central neural block, vaginal, epidural, spinal block

## CONTRAINDICATIONS
Children <12 yr, geriatric, hypersensitivity to amide local anesthetics, severe liver disease, severe hypotension, complete heart block

**Precautions:** Pregnancy, severe product allergies, hyperthyroidism, CV, hepatic/neurologic disease

## DOSAGE AND ROUTES
### Lumbar epidural block for C-section
**Adult:** 20-30 ml of 0.5% SOL, or 15-20 ml of 0.75% SOL

### Thoracic epidural
**Adult:** 5-15 ml of 0.5%-0.75% SOL

### Major nerve block
**Adult:** 35-50 ml of 0.5% SOL or 10-40 ml of 0.75% SOL

### Labor pain epidural
**Adult:** 10-20 ml of 0.2% SOL, then 6-14 ml/hr

### Postoperative (lumbar/thoracic epidural)
**Adult:** 6-14 ml/hr of 0.2% SOL

### Infiltration/minor nerve block
**Adult:** 1-100 ml of 0.2% SOL or 1-40 ml of 0.5% SOL

**Available forms:** Inj 2, 5, 7.5 mg/ml

### Implementation
• Give only with resuscitative equipment nearby
• Give only products without preservatives for epidural or caudal anesthesia
• Use new sol; discard unused portions

## ADVERSE EFFECTS
**CNS:** Anxiety, restlessness, seizures, loss of consciousness, drowsiness, disorientation, tremors, shivering, paresthesia
**CV:** Myocardial depression, cardiac arrest, dysrhythmias, bradycardia, *hypo*/hypertension, fetal bradycardia
**EENT:** Blurred vision, tinnitus, pupil constriction
**ENDO:** Hypokalemia
**GI:** Nausea, vomiting
**GU:** Urinary retention
**INTEG:** Rash, urticaria, allergic reactions, edema, burning, skin discoloration at injection site, tissue necrosis
**RESP:** Status asthmaticus, respiratory arrest, anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 2-8 min |
| **Peak** | Unknown |
| **Duration** | 3 hr, varies with inj site |

## INTERACTIONS

### Individual drugs

Amiodarone, cimetidine, ciprofloxacin, fluvoxaMINE, imipramine, theophylline: increased effect

Chloroprocaine: decreased action of ropivacaine

Enflurane, EPINEPHrine, halothane: increased dysrhythmias

### Drug classifications

Antidepressants (tricyclics), MAOIs, phenothiazines: increased hypertension

Azole antifungals: increased effect

## NURSING CONSIDERATIONS

### Assessment

- Assess B/P, pulse, respiration during treatment
- Assess fetal heart tones during labor
- Assess allergic reactions: rash, urticaria, itching
- Assess cardiac status: ECG for dysrhythmias, pulse, B/P during anesthesia

### Evaluation

**Positive therapeutic outcome**

- Anesthesia necessary for procedure

## TREATMENT OF OVERDOSE:

Airway, $O_2$, vasopressor, **IV** fluids, anticonvulsants for seizures

**⚠ HIGH ALERT**

# rosiglitazone (Rx)

(rose-i-glye′ta-zone)

**Avandia**

*Func. class.:* Antidiabetic, oral

*Chem. class.:* Thiazolidinedione

**Do not confuse:** rosiglitazone/pioglitazone, Avandia/Prandin

**ACTION:** Improves insulin resistance by hepatic glucose metabolism, insulin receptor kinase activity, insulin receptor phosphorylation

**Therapeutic outcome:** Decreased symptoms of diabetes mellitus

**USES:** Stable type 2 diabetes mellitus alone or in combination with sulfonylureas, metformin, or insulin

## CONTRAINDICATIONS

Breastfeeding, children, hypersensitivity to thiazolidinediones, diabetic ketoacidosis, jaundice, type 1 diabetes

**BLACK BOX WARNING:** NYHA III or IV acute heart failure, heart failure

**Precautions:** Pregnancy, geriatric, thyroid/renal/hepatic disease, heart failure, NYHA class I, II, MI

## DOSAGE AND ROUTES

**Adult:** PO 4 mg/day or in 2 divided doses, may increase to 8 mg/day or in 2 divided doses after 12 wk; may be added to metformin, sulfonylureas at the adult dose

**Available forms:** Tabs 2, 4, 8 mg

### Implementation

- Convert from other oral hypoglycemic agents if needed; change may be made without gradual dosage change; monitor blood glucose during conversion
- Give tabs crushed and mixed with meal or fluids for patients with difficulty swallowing

**PO route**

- Give once or in 2 divided doses without regard to food
- Store in airtight container in cool environment

## ADVERSE EFFECTS

**CNS:** Fatigue, *headache*

**CV:** HF, MI, death (geriatric patients)

**ENDO:** Hyper/hypoglycemia

**GI:** Weight gain, hepatotoxicity, increased total cholesterol, LDL, HDL, decreased free fatty acids

**MISC:** Accidental injury, upper respiratory tract infection, sinusitis, anemia, back pain, diarrhea, edema, bone fractures (female), pulmonary/macular/peripheral edema

**SYST:** Anaphylaxis, Stevens-Johnson syndrome, lactic acidosis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 99.8% |
| **Metabolism** | Unknown |
| **Excretion** | Urine, feces, breast milk |
| **Half-life** | Elimination 3-4 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 6-12 wk |
| **Duration** | Unknown |

R

## INTERACTIONS

### Individual drugs

FluvoxaMINE, gemfibrozil, ketoconazole: increased hypoglycemia; monitor glucose
Insulin: avoid concurrent use

### Drug classifications

CYP2C5 inducers/inhibitors: may increase/decrease effect
Nitrates: avoid concurrent use

### Drug/herb

Horse chestnut: increased antidiabetic effect

### Drug/lab test

Increased: ALT, HDL, LDL, total cholesterol, blood glucose
Decreased: Hgb/Hct

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Use in NYHA III or IV acute heart failure is contraindicated; any deterioration in any cardiac status, discontinue product

**BLACK BOX WARNING: HF/MI:** assess for dyspnea, edema, weight gain ≥5 lb, jugular vein distention; may need to change or discontinue; do not use in acute coronary syndrome

- **Lactic acidosis:** assess for dyspnea, abdominal pain, muscle pain; notify prescriber immediately
- Assess for hypoglycemic reactions (sweating, weakness, dizziness, anxiety, tremors, hunger), hyperglycemic reactions soon after meals; monitor FBS, blood glucose glycosylated hemoglobin A1C (HbA1c)
- **Assess for systemic reactions:** anaphylaxis, Stevens-Johnson syndrome
- **Hepatotoxicity:** check liver function tests periodically; AST, ALT (if ALT is >2.5 × ULN, do not use)
- Monitor HbA2c, plasma lipids, lipoproteins, B/P, body weight baseline and periodically during treatment
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, usually insulin is used in pregnancy, do not breastfeed, excretion unknown
- **Beers:** Avoid in older adults, may promote fluid retention or exacerbate heart failure

### Patient/family education

- Teach patient to monitor capillary blood glucose test, that periodic liver function tests are mandatory; to report edema, weight gain
- Teach patient symptoms of hypo/hyperglycemia, what to do about each, that these symptoms are more likely to occur in those using insulin
- Advise patient that product must be continued on daily basis; explain consequence of discontinuing product abruptly
- Advise patient to avoid OTC medications, nitrates, insulin, or herbal preparations unless approved by prescriber
- Advise patient that diabetes is lifelong illness; that this product is not a cure, only controls symptoms
- Advise patient that all food included in diet plan must be eaten to prevent hypoglycemia
- Advise patient to carry/wear emergency ID and glucagon emergency kit for emergencies
- Instruct patient to notify prescriber if oral contraceptives are used
- Teach patient not to use if breastfeeding; may be secreted in breast milk, may alter blood glucose
- **Hepatotoxicity:** advise patient to report nausea, vomiting, abdominal pain, fatigue, anorexia, dark urine, jaundice; to report macular edema (change in vision) immediately
- Teach patient that 2 wk is needed to see a reduction in blood glucose, 2-3 mo to see full effect

### Evaluation

**Positive therapeutic outcome**

- Decrease in polyuria, polydipsia, polyphagia; clear sensorium; absence of dizziness; stable gait; blood glucose, A1c improvement

## rosuvastatin (Rx)

(roe-soo'va-sta-tin)
**Crestor**
*Func. class.:* Antilipemic
*Chem. class.:* HMG-CoA reductase inhibitor

**ACTION:** Inhibits HMG-CoA reductase, which reduces cholesterol synthesis

**Therapeutic outcome:** Decreasing cholesterol levels

**USES:** As an adjunct in primary hypercholesterolemia (types IIa, IIb), mixed dyslipidemia elevated serum triglycerides, homozygous/heterozygous familial hypercholesterolemia (FH), slowing of atherosclerosis, CV disease prophylaxis, MI, stroke prophylaxis (normal LDL)

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity, active liver disease

**Precautions:** Children <10 yr, geriatric, past liver disease, alcoholism, severe acute infections, trauma, hypotension, uncontrolled seizure disorders, severe metabolic disorders, electrolyte imbalances, severe renal impairment, hypothyroidism, Asian patients

## DOSAGE AND ROUTES

Patient should first be placed on a cholesterol-lowering diet

### For the treatment of hypercholesterolemia, hyperlipoproteinemia, and/or hypertriglyceridemia as an adjunct to dietary control

For reduction of elevated total cholesterol, LDL-cholesterol, apolipoprotein B, and triglyceride concentrations, and to increase HDL-cholesterol in patients with primary hypercholesterolemia (heterozygous familial and nonfamilial) or mixed dyslipidemia (Fredrickson types IIa or IIb); or to treat Fredrickson Type IV (hypertriglyceridemia, increased VLDL); or to treat primary dysbetalipoproteinemia (Type III hyperlipoproteinemia)

**Adult:** PO The usual starting dose is 10 mg q day, 5 mg q day in those requiring less aggressive LDL-reductions, patients with CrCl less than 30 mL/minute, or patients at higher risk for myopathy

### For the reduction of total cholesterol, LDL-cholesterol, nonHDL-cholesterol, and apolipoprotein B concentrations in patients with homozygous familial hypercholesterolemia (HoFH)

**Adult:** PO the usual starting dose is 20 mg q day.

**Children and Adolescents:** 7 to 17 years PO 20 mg q day

### For the reduction of total cholesterol, LDL-cholesterol, and apolipoprotein B concentrations in pediatric patients with heterozygous familial hypercholesterolemia (HeFH)

**Children and Adolescents:** 10 to 17 yrs PO 5 to 20 mg q day, Individualize based on the goals of therapy. Adjust dose q 4 wk or more

**Children 8 to 9 yrs:** PO 5 to 10 mg q day, individualize based on the goals of therapy. Adjust dose q 4 wks or more.

### For slowing the progression of atherosclerosis (e.g., carotid, coronary)

**Adults:** PO The usual starting dose is 10 mg q day. 5 mg q day may be initiated in those requiring less aggressive LDL-reductions, patients with CCr less than 30 mL/minute, or patients at higher risk for myopathy.

### For primary prevention of cardiovascular disease including myocardial infarction prophylaxis and stroke prophylaxis, and to reduce the risk of arterial revascularization procedures in patients without evidence of coronary heart disease but who have risk factors for cardiovascular disease

**Adults:** PO The usual starting dose is 10 to 20 mg q day, with a dose range of 5 to 40 mg q day.

### Renal Dose

**Adult:** PO CCr < 30 ml/min: Initially, 5 mg q day in those not receiving dialysis. Max 10 mg q day

**Available forms:** Tabs 5, 10, 20, 40 mg

### Implementation

- May be taken at any time of day, with or without food
- Store in cool environment in airtight, light-resistant container

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness,* insomnia, paresthesia, confusion

**GI:** *Nausea, constipation, abdominal pain, flatus, diarrhea, dyspepsia, heartburn,* kidney failure, liver dysfunction, vomiting

**HEMA:** Thrombocytopenia, hemolytic anemia, leukopenia

**INTEG:** *Rash, pruritus*

**MS:** *Asthenia, muscle cramps, arthritis, arthralgia, myalgia,* myositis, rhabdomyolysis, leg, shoulder, or localized pain

**RESP:** Rhinitis, sinusitis, *pharyngitis,* increased cough

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 88% protein bound, crosses placenta |
| **Metabolism** | Minimal liver metabolism (about 10%) |
| **Excretion** | Primarily in feces (90%) |
| **Half-life** | 19 hr |

R

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 3-5 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol: increased hepatotoxicity
Clofibrate, cycloSPORINE, gemfibrozil, niacin: increased myalgia, myositis
Warfarin: increased bleeding

### Drug classifications

Antifungals (azole), antiretroviral protease inhibitors, fibric acid derivatives: increased myalgia, myositis
Bile acid sequestrants: increased effects

### Drug/herb

St. John's wort: decreased rosuvastatin effect

### Drug/lab test

Increased: CPK, liver function tests

## NURSING CONSIDERATIONS

### Assessment

- Assess diet: obtain diet history including fat, cholesterol in diet
- Monitor fasting cholesterol, LDL, HDL, triglycerides periodically during treatment
- Liver function: monitor liver function tests q1-2mo during the first 1½ yr of treatment; AST, ALT, liver function tests may increase
- Monitor renal function in patients with compromised renal system: BUN, creatinine, I&O ratio
- Obtain ophthalmic exam before, 1 mo after treatment begins, annually; lens opacities may occur
- **Rhabdomyolysis:** Assess for muscle pain, tenderness, obtain CPK; if these occur, product may need to be discontinued; for Asian ancestry: increased blood levels, rhabdomyolysis
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

- Advise to report suspected pregnancy, to use contraception while taking this product, pregnancy, not to breastfeed
- Advise that blood work and ophthalmic exam will be necessary during treatment
- Teach to report blurred vision, severe GI symptoms, dizziness, headache, muscle pain, weakness
- Teach that previously prescribed regimen will continue: low-cholesterol diet, exercise program, smoking cessation; liver injury (jaundice, anorexia, abdominal pain)

### Evaluation

**Positive therapeutic outcome**

- Cholesterol at desired level after 8 wk

**RARELY USED**

# rufinamide (Rx)

(roo-fin'a-mide)
**Banzel**
*Func. class.:* Anticonvulsant
*Chem. class.:* Triazole derivative

## ACTION:

May act through action at sodium channels; exact action is unknown

**Therapeutic outcome:** Decrease in severity of seizures

## USES:

Lennox-Gastaut syndrome

## CONTRAINDICATIONS

Hypersensitivity, familial short QT syndrome

**Precautions:** Pregnancy, breastfeeding, renal/hepatic disease, geriatric patients, child <16 yr, depression, dialysis, hazardous activities, suicidal ideation

## DOSAGE AND ROUTES

**Adult:** PO 400-800 mg/day divided bid, increase by 400-800 mg/day q2day to 3200 mg/day
**Child ≥4 yr:** PO 10 mg/kg/day divided equally bid; increase by 10 mg/kg/day every other day to 45 mg/kg/day or 3200 mg/day, whichever is less

**Available forms:** Tabs 200, 400 mg; oral susp 40 mg/ml

### Implementation

- **PO tabs:** Give with food, may give whole, crushed, or halved
- **Oral susp:** Shake well before use, use provided adapter and calibrated oral dosing syringe, insert adapter firmly in neck of bottle before use and keep in place for the duration of bottle use, insert dosing syringe into the adapter and withdraw dose from inverted bottle, replace cap after each use, use within 90 days of opening, give with food

## ADVERSE EFFECTS

**CNS:** Dizziness, ataxia, drowsiness, fever, seizures, tremor, fatigue, headache, gait disturbance
**EENT:** Diplopia, blurred vision, nystagmus
**GI:** Nausea, hepatitis, vomiting
**HEMA:** Anemia, leukopenia, neutropenia, thrombocytopenia, lymphadenopathy
**INTEG:** Rash, urticaria, Stevens-Johnson syndrome

**MISC:** Edema, hematuria, influenzae, nephrolithiasis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | Terminal 6-10 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 4-6 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

CarBAMazepine, PHENobarbital, phenytoin, primidone: decreased effect of rufinamide
Valproate: increased rufinamide effect

### Drug classifications

Hormonal contraceptives: decreased effect

### Drug/lab test

Increased: LFTs

## NURSING CONSIDERATIONS

### Assessment

- **Seizures:** Assess for duration, type, intensity precipitating factors
- **Assess mental status:** mood, sensorium, affect, memory (long, short), increased suicidal thoughts/actions

### Patient/family education

- Caution patient not to discontinue product abruptly; seizures may occur
- Advise patient to avoid hazardous activities until stabilized on product
- Instruct patient to carry emergency ID stating product use
- Instruct patient to notify prescriber if pregnancy is planned or suspected, to use alternative form of contraception; hormonal contraceptives may be decreased
- Inform patient to take adequate fluids

### Evaluation

#### Positive therapeutic outcome

- Decrease in severity of seizures

RABEprazole (Rx)
ramelteon (Rx)
ranitidine (Rx)
rasburicase (Rx)
retapamulin topical

$Rh_0$ (D) immune globulin microdose IM
ribavirin (Rx)
rifampin (Rx)
riluzole (Rx)
ritonavir (Rx)
rivastigmine (Rx)
romiPLOStim (Rx)
rosiglitazone (Rx)
raloxifene (Rx)
ramipril (Rx)
ranolazine (Rx)
regorafenib
retinoic acid

$Rh_0$ (D) immune globulin microdose (IM, IV)
riboflavin (vitamin $B_2$) (OTC)
rifaximin (Rx)
risedronate (Rx)
riTUXimab (Rx)
rizatriptan (Rx)
rOPINIRole (Rx)
rosuvastatin (Rx)
raltegravir (Rx)
ranibizumab (Rx)
rasagiline (Rx)
repaglinide (Rx)
$Rh_0$ (D) immune globulin, standard dose IM
$Rh_0$ (D) immune globulin IV

rifabutin (Rx)
rilpivirine
risperiDONE (Rx)
rivaroxaban
roflumilast
ropivacaine (Rx)
rufinamide (Rx)

## salicylic acid topical

*See Appendix B*

## salmeterol (Rx)

(sal-met'er-ole)

**Serevent, Serevent Diskus**

*Func. class.:* Adrenergic $\beta_2$ agonist, (long acting) bronchodilator

**ACTION:** Causes bronchodilatation by action on $\beta_2$ (pulmonary) receptors by increasing levels of cyclic AMP, which relaxes smooth muscle; with very little effect on heart rate, maintains improvement in FEV from 3 to 12 hr; prevents nocturnal asthma symptoms

**Therapeutic outcome:** Ease of breathing

**USES:** Prevention of exercise-induced asthma, bronchospasm, COPD

## CONTRAINDICATIONS

Hypersensitivity to sympathomimetics, tachydysrhythmias, severe cardiac disease, monotherapy treatment of asthma

**Precautions:** Pregnancy, breastfeeding, cardiac disorders, hyperthyroidism, diabetes mellitus, hypertension, prostatic hypertrophy, closed-angle glaucoma, seizures, acute asthma, as a substitute for corticosteroids, QT prolongation

**BLACK BOX WARNING:** Asthma-related death, children <4 yr

## DOSAGE AND ROUTES

**Adult/child ≥4 yr:** INH 50 mcg (one inhalation as dry powder); **exercise-induced bronchospasm:** 50 mcg (2 INH) ½-1 hr prior to exercise

**Available forms:** Inhalation powder 50 mcg/blister

### Implementation

- Shake aerosol container, ask patient to exhale, then place mouthpiece in mouth, inhale slowly, hold breath, remove, exhale slowly; allow at least 1 min between inhalations
- Use this medication before other medications and allow at least 1 min between each
- Use spacing device for pediatric/geriatric patients
- Store in foil pouch; do not expose to temp >86° F (30° C); discard 6 wk after removal from foil pouch
- Use 1/2 hr prior to exercise for exercise-induced bronchospasm prevention
- Don't use spacer with this product

## ADVERSE EFFECTS

**CNS:** *Tremors, anxiety,* insomnia, headache, dizziness, fever

**CV:** Palpitations, tachycardia, angina, hypo/hypertension, dysrhythmias

**EENT:** Dry nose, irritation of nose and throat

**GI:** Heartburn, nausea, vomiting, abdominal pain

**MS:** Muscle cramps

**RESP:** Bronchospasm, cough, asthma-related death

### Pharmacokinetics

Unknown

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 5-15 min |
| **Peak** | 4 hr |
| **Duration** | 12 hr |

## INTERACTIONS

### Drug classifications

Antidepressants (tricyclics): increased salmeterol action

β-Adrenergic blockers: block therapeutic effect

Bronchodilators, aerosol: increased action of bronchodilator

CYP3A4 inhibitors (itraconazole, ketoconazole, nelfinavir, nefazodone, saquinavir): increased CV effects

MAOIs: increased action of salmeterol

### Drug/herb

Betel palm, butterbur, coffee, cola nut, figwort, fumitory, guarana, hawthorn, lily of the valley, motherwort, plantain, tea (black, green), yerba maté: increased stimulation

## NURSING CONSIDERATIONS

### Assessment

- **Respiratory function:** assess vital capacity, FEV, ABGs, lung sounds, heart rate, rhythm (baseline)
- **Paradoxical bronchospasm:** monitor for dyspnea, wheezing, chest tightness, do not use in bronchospasm

**BLACK BOX WARNING:** Children should not use this product as monotherapy for asthma; use only with persistent asthma in those that are not well-controlled with a long-term asthma product, after product controls asthma, use another bronchodilator

- **Hypersensitivity:** Assess for rash, urticaria, rarely leads to anaphylaxis, angioedema
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excretion unknown

**BLACK BOX WARNING:** Asthma-related death

### Patient/family education

- Caution patient not to use OTC medications because extra stimulation may occur
- Instruct patient to use this medication before other medications and to allow at least 1 min between each, to prevent overstimulation
- Teach patient how to use inhaler; to avoid getting aerosol in eyes; blurring may result; to wash inhaler in warm water daily and dry; to avoid smoking, smoke-filled rooms, and persons with respiratory infections; review package insert with patient
- Instruct patient on administration of dose, not to use more than prescribed; serious side effects may occur
- Teach patient not to use for exercise-induced bronchospasm, never exhale into diskus, hold level, keep mouthpiece dry
- Teach patient not to use for treatment of acute exacerbation, a fast-acting β-blocker should be used instead
- Teach patient to report immediately dyspnea after use, if 1 canister or more is used in 2 mo time
- Teach patient to notify prescriber if >4 inhalations are needed, or if product is no longer working
- **Multidose:** Advise patient not to get canister or mouthpiece wet, not to use spacer, not to exhale into mouthpiece
- Teach patient to take other products as prescribed

**BLACK BOX WARNING:** Asthma-related death: Teach patient to seek medical attention immediately for serious asthma attack, death may be greater in Black patients

- Advise patient to use 1/2-1 hr before exercising if using to prevent exercise-induced bronchospasm
- **Pregnancy/breastfeeding:** Advise patient to notify provider if pregnancy is planned or if breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Absence of dyspnea, wheezing
- Improved airway exchange
- Improved ABGs

## TREATMENT OF OVERDOSE:

Administer a $\beta_2$-adrenergic blocker

**⚠ HIGH ALERT**

## sargramostim (Rx)

(sar-gram′oh-stim)

**Leukine, rhu GM-CSF**

*Func. class.:* Biological modifier, hematopoietic agent cytokine

*Chem. class.:* Granulocyte-macrophage colony-stimulating factor (GM-CSF)

**Do not confuse:** Leukine/leucovorin/Leukeran

**ACTION:** Stimulates proliferation and differentiation of hematopoietic progenitor cells (granulocyte, macrophage)

**Therapeutic outcome:** WBC and differential recovery

**USES:** Acceleration of myeloid recovery in patients with non-Hodgkin's lymphoma, acute lymphoblastic leukemia, acute myelogenous leukemia, autologous bone marrow transplantation in Hodgkin's disease; bone marrow transplantation failure or engraftment delay; mobilization and transplant of peripheral blood progenitor cells (PBPCs)

**Unlabeled uses:** Aplastic anemia, Crohn's disease, ganciclovir- or zidovudine-induced neutropenia, myelodysplastic syndrome (MDS)

## CONTRAINDICATIONS

Hypersensitivity to GM-CSF, benzyl alcohol, yeast products; excessive leukemic myeloid blast in the bone marrow or peripheral blood, neonates

**Precautions:** Pregnancy, breastfeeding, children, renal/hepatic/lung/cardiac disease, pleural/pericardial effusions, peripheral edema, leukocytosis, mannitol hypersensitivity, hepatic/renal disease

## DOSAGE AND ROUTES

### Myeloid recovery in Hodgkin's disease, non-Hodgkin's lymphoma, acute lymphocytic leukemia

**Adult:** IV 250 mcg/m$^2$/day over a 2-hr period beginning 2-4 hr following infusion of bone marrow and not <24 hr after last dose of chemotherapy or radiotherapy

**Child (unlabeled):** SUBCUT/IV 250 mcg/m$^2$/day beginning 2-4hr after infusion of bone marrow and not <24hr after last dose of chemotherapy

### Acceleration of myeloid recovery

**Adult: IV** 250 mcg/m$^2$/day × 14 days; give over 2 hr; may repeat in 7 days, may repeat 500 mcg/m$^2$/day × 14 days after another 7 days if no improvement

### Mobilization of PBPCs
**Adult:** CONT **IV** 250 mcg/m$^2$/day over 24 hr or SUBCUT qday continue through collection during collection of PBPCs

### After PBPC transplantation
**Adult:** CONT **IV** 250 mcg/m$^2$/day until ANC >1500/mm$^3$ × 3 days

**Available forms:** Powder for inj lyophilized 250 mcg; solution for injection 500 mcg/ml

### Implementation
- Store in refrigerator; do not freeze

**SUBCUT route**
- No further dilution of reconstituted sol is needed; take care not to inject intradermally

**Intermittent IV infusion route**
- After reconstituting with 1 ml sterile water for inj without preservative; do not reenter vial; discard unused portion; direct reconstitution sol at side of vial; rotate contents, do not shake
- Dilute in 0.9% NaCl inj to prepare IV inf; if final concentration is <10 mcg/ml, add human albumin to make a final concentration of 0.1% to NaCl before adding sargramostim to prevent adsorption; for a final concentration of 0.1% albumin, add 1 mg human albumin/1 ml 0.9% NaCl inj run over 2 hr **(bone marrow transplant or failure of graft);** over 4 hr **(chemotherapy for AML);** over 24 hr as cont inf **(PBPCs);** give within 6 hr after reconstitution

**Y-site compatibilities:** Amikacin, aminophylline, aztreonam, bleomycin, butorphanol, calcium gluconate, CARBOplatin, carmustine, ceFAZolin, cefepime, cefotaxime, cefoTEtan, ceftizoxime, cefTRIAXone, cefuroxime, cimetidine, CISplatin, clindamycin, cyclophosphamide, cycloSPORINE, cytarabine, dacarbazine, DACTINomycin, dexamethasone, diphenhydrAMINE, DOPamine, DOXOrubicin, doxycycline, droperidol, etoposide, famotidine, fentaNYL, floxuridine, fluconazole, fluorouracil, furosemide, gentamicin, granisetron, heparin, IDArubicin, ifosfamide, immune globulin, magnesium sulfate, mannitol, mechlorethamine, meperidine, mesna, methotrexate, metoclopramide, metroNIDAZOLE, minocycline, mitoXANtrone, netilmicin, pentostatin, piperacillin/tazobactam, potassium chloride, prochlorperazine, promethazine, ranitidine, teniposide, ticarcillin, ticarcillin-clavulanate, trimethoprim-sulfamethoxazole, vinBLAStine, vinCRIStine, zidovudine

**Y-site incompatibilities:** Acyclovir, ampicillin, ampicillin/sulbactam, cefonicid, cefoperazone, cefTAZidime, chlorproMAZINE, ganciclovir, haloperidol, hydrocortisone, HYDROmorphone, hydrOXYzine, IDArubicin, imipenem/cilastatin, LORazepam, methylPREDNISolone sodium succinate, mitoMYcin, morphine, nalbuphine, ondansetron, piperacillin, sodium bicarbonate, tobramycin

## ADVERSE EFFECTS
**CNS:** Fever, malaise, CNS disorder, weakness, chills, dizziness, syncope, headache
**CV:** Transient supraventricular tachycardia, peripheral edema, pericardial effusion, hypotension, tachycardia
**GI:** Nausea, vomiting, diarrhea, anorexia, GI hemorrhage, stomatitis, liver damage, hyperbilirubinemia
**GU:** Urinary tract disorder, abnormal kidney function
**HEMA:** Blood dyscrasias, hemorrhage
**INTEG:** Alopecia, rash, peripheral edema
**MS:** Bone pain, myalgia
**RESP:** Dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Completely absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Elimination **IV** 60 min; SUBCUT 2-3 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | 2 hr |
| **Duration** | Unknown |

## INTERACTIONS
### Individual drugs
Lithium: increased myeloproliferation

### Drug classifications
Antineoplastics or radiation, separate by ≥24 hr
Corticosteroids: increased myeloproliferation

### Drug/lab test
Increased: bilirubin, BUN, creatinine, eosinophils, LFTs, leukocytes

## NURSING CONSIDERATIONS
### Assessment
- **Monitor blood studies:** CBC, differential count before treatment and twice weekly; leukocytosis may occur (WBC >50,000 cells/mm$^3$, ANC >20,000 cells/mm$^3$), platelets; if ANC >20,000/mm$^3$ or 10,000/mm$^3$ after nadir has occurred or platelets >500,000/mm$^3$, reduce dose by ½ or discontinue; if blast cells occur, discontinue
- Monitor renal/liver function tests before treatment: BUN, creatinine, urinalysis; AST, ALT,

alkaline phosphatase; monitoring is needed twice a week in renal/hepatic disease
• **Gasping syndrome in neonates:** assess for, due to benzyl alcohol hypersensitivity, do not use
• Assess for **hypersensitivity reactions**/rashes and local inj site reactions; usually transient
• Assess for increased fluid retention in cardiac disease, body weight, hydration status, pulmonary function
• **Constitutional symptoms:** asthenia, chills, fever, headache, malaise
• Assess for myalgia, arthralgia in legs, feet; use analgesics, antipyretics
• **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding, excretion unknown

### Patient/family education
• Teach patient reason for medication and expected results
• Advise patient to notify nurse or prescriber immediately of dyspnea, excessive diarrhea, B/P increase
• Review all aspects of product use
• Advise patient bone pain may occur with use of this product and is normal

### Evaluation
**Positive therapeutic outcome**
• WBC and differential recovery
• Absence of infection

**⚠ HIGH ALERT**

## saxagliptin (Rx)
(sax-a-glip'tin)
**Onglyza**
*Func. class.:* Antidiabetic, oral
*Chem. class.:* Dipeptidyl-peptidase-4 (DPP-4) inhibitor

**Do not confuse:** saxagliptin/sitaGLIPtin

**ACTION:** Slows the inactivation of incretin hormones, improves glucose homeostasis, improves glucose-dependent insulin synthesis, lowers glucagon secretions and slows gastric emptying time

**Therapeutic outcome:** Decrease in polyuria, polydipsia, polyphagia; clear sensorium; absence of dizziness; stable gait; blood glucose at normal level

**USES:** Type 2 diabetes mellitus as monotherapy or in combination with other antidiabetic agents

## CONTRAINDICATIONS
Hypersensitivity, angioedema, serious rash

**Precautions:** Pregnancy, geriatric, GI obstruction, thyroid disease, surgery, renal/hepatic disease, trauma, diabetic ketoacidosis (DKA), type 1 diabetes mellitus, heart failure

## DOSAGE AND ROUTES
**Adjust diet, exercise to improve glycemic control (type 2 diabetes)**
**Adult:** PO 2.5-5 mg; may use with other antidiabetic agents (metformin, pioglitazone, rosiglitazone), if used with insulin, a lower dose is needed; max 2.5 mg with strong 3A4-5 inhibitors

### Renal dose
**Adult:** PO CCr ≤50 ml/min 2.5 mg/day; hemodialysis: 2.5 mg qday after hemodialysis

**Available forms:** Tabs 2.5; 5 mg

### Implementation
**PO route**
• May be taken with or without food
• Conversion from other antidiabetic agents; change may be made with gradual dosage change
• Store in tight container at room temperature
• Do not break or cut tabs

## ADVERSE EFFECTS
**CNS:** *Headache*
**CV:** Edema
**EENT:** Sinusitis
**ENDO:** Hypoglycemia (renal impairment)
**GI:** *Nausea, vomiting,* abdominal pain, pancreatitis
**GU:** UTI
**INTEG:** Urticaria, angioedema, anaphylaxis
**META:** *Hypoglycemia*
**MISC:** Lymphopenia, peripheral edema
**RESP:** Upper respiratory infection, sinusitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys 24% unchanged |
| **Half-life** | Terminal 2.5 hr, 3.1 hr metabolite |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-4 hr |
| **Duration** | 24 hr |

S

## INTERACTIONS

### Individual drugs

Aripiprazole, cloZAPine, fosphenytoin, OLANZapine, phenytoin, QUEtiapine, risperiDONE, ziprasidone: decreased antidiabetic effect

Cimetidine, disopyramide: increased saxagliptin level

Cimetidine, FLUoxetine: increased hypoglycemia

Digoxin: increased levels of digoxin

### Drug classifications

ACE inhibitors, estrogens, oral contraceptives, phenothiazines, progestins, protease inhibitors, sympathomimetics, thiazide diuretics: decreased antidiabetic effect

Androgens, β-blockers, corticosteroids, fibric acid derivatives, insulins, MAOIs, salicylates: increased hypoglycemia, dosage reduction may be needed

### Drug/herb

Garlic, horse chestnut: increased antidiabetic effect

### Drug/lab test

Decreased: lymphocytes, glucose

## NURSING CONSIDERATIONS

### Assessment

- **Hypoglycemic reactions** (sweating, weakness, dizziness, anxiety, tremors, hunger); monitor blood glucose (BG) as needed
- Monitor CBC (baseline, q3mo) during treatment; check liver function tests periodically, AST, LDH, renal studies: BUN, creatinine during treatment; glycosylated hemoglobin HbA1C
- **Heart failure:** history of risk factors for heart failure, use cautiously, in these patients
- **Pancreatitis:** abdominal pain, nausea, vomiting; discontinue product immediately, previous pancreatitis may be a contributing factor
- **Pregnancy/breastfeeding:** Use only if clearly needed, usually insulin is used in pregnancy, cautious use in breastfeeding, excretion unknown

### Patient/family education

- Teach patient to use regular self-monitoring of blood glucose using blood glucose meter
- Teach patient the symptoms of hypo/hyperglycemia; what to do about each
- Teach patient that product must be continued on daily basis; explain consequence of discontinuing product abruptly
- Advise patient to avoid OTC medications, alcohol, digoxin, exenatide, insulins, nateglinide, repaglinide, and other products that lower blood sugar, unless approved by prescriber
- Teach patient that diabetes is a lifelong illness; that this product is not a cure, only controls symptoms
- Teach patient that all food included in diet plan must be eaten to prevent hypo/hyperglycemia
- Teach patient to carry emergency ID
- Teach patient to take product without regard to food
- Teach patient to notify prescriber when surgery, trauma, or stress occurs, as dose may need to be adjusted, or insulin used
- **Pancreatitis:** Teach patient to immediately report and stop taking product if severe abdominal pain with vomiting occurs
- **Hypersensitivity:** Advise patient to immediately seek medical assistance and stop product if itching, rash, swelling of face, tongue occur

### Evaluation

**Positive therapeutic outcome**

- Decrease in polyuria, polydipsia, polyphagia; clear sensorium; absence of dizziness; stable gait; blood glucose at normal level

**RARELY USED**

## scopolamine (Rx)

(skoe-pol′a-meen)

**Transderm-Scop**

*Func. class.:* Cholinergic blocker

*Chem. class.:* Belladonna alkaloid

**Therapeutic outcome:** Absence of vomiting, secretions (preoperatively), involuntary movements

**USES:** Reduction of secretions before surgery, production of amnesia, prevention of motion sickness, Parkinson's symptoms

**Unlabeled uses:** Drooling (TD)

## CONTRAINDICATIONS

Hypersensitivity, closed-angle glaucoma, myasthenia gravis, GI/GU obstruction, hypersensitivity to belladonna, barbiturates

## DOSAGE AND ROUTES

### Prevention of motion sickness

**Adult:** Transdermal 1 patch placed behind ear 4 hr before travel, reapply q3day

### Preoperatively

**Adult:** IM/IV/SUBCUT 0.32-0.65 mg; TD apply 1 patch PM before surgery or 1 hr before C-section

### Nausea and vomiting

**Adult:** SUBCUT 0.6-1 mg

**Child:** SUBCUT 0.006 mg/kg; max 0.3 mg/dose

**Drooling (unlabeled)**
**Adult:** Transdermal 1.5 mg patch q3day

## secukinumab (Rx)

(sek′-ue-kin′-ue-mab)
**Cosentyx**
*Func. class.:* Immune response modifier

## ACTION

**ACTION:** Interleukin (IL)-12, IL-23 antagonist

**Therapeutic outcome:** Decreasing plaque psoriasis

## USES

**USES:** Plaque psoriasis

## CONTRAINDICATIONS

Hypersensitivity, active TB

**Precautions:** Pregnancy, breastfeeding, latex hypersensitivity, Crohn's disease, vaccination, infection

## DOSAGE AND ROUTES

**Adult: SUBCUT** 300 mg at wk 0, 1, 2, 3, 4, and then q4wk thereafter

**Available forms:** Sol for inj 150 mg/ml (pen, prefilled syringe) 2 packs, singles

### Implementation

- Use by **SUBCUT** inj only
- Those with latex hypersensitivity should not handle cap of inj

**SUBCUT Inj**

- Patients may use the prefilled syringe or Sensoready pen after proper training; the lyophilized powder is for health care provider use only
- Each 300-mg dose is used as 2 **SUBCUT** inj of 150 mg
- Do not administer where skin is tender, bruised, erythematous, indurated, or affected by psoriasis.

**Reconstitution of lyophilized powder:**

- Allow to warm to room temperature for 15-30 min, use 1 ml sterile water for inj to reconstitute, rotate, do not shake or invert vial, allow to stand for 10 min, again rotate vial, allow to stand for another 5 min (150 mg/ml)
- Storage: Use immediately or refrigerate for up to 24 hr. Do not freeze. If refrigerated, allow reconstituted solution to reach room temperature (15-30 min) before administration

**Preparation for use of prefilled syringe or Sensoready pen:**

- Remove prefilled syringe or Sensoready pen from refrigerator and allow 15-30 min to reach room temperature
- Storage: The prefilled syringe or Sensoready pen should be used within 1 hr

## ADVERSE EFFECTS

**EENT:** Ocular infections, sinusitis, oral ulceration, rhinitis, sinusitis
**GI:** Diarrhea
**INTEG:** Urticaria
**SYST:** Serious infections, anaphylaxis, antibody formation, candidiasis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Interstitial fluid in lesional and non-lesional skin |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 22-31 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 6 days |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Immunosupressives: avoid use with immunosuppressives
Vaccines: do not give concurrently with vaccines; immunizations should be brought up to date before treatment

### Drug/lab test

Increased: LFTs

## NURSING CONSIDERATIONS

### ASSESSMENT

- **TB:** TB testing should be done before starting treatment
- Bring immunizations up to date before starting treatment
- **Infection:** monitor for fever, sore throat, cough; do not use during active infections
- **Malignancy:** Skin cancer may occur especially in older patients who have used ultraviolet treatments with immunosuppressants
- Assess for inj site pain, swelling

### Patient/family education

- Advise patient that product must be continued for prescribed time to be effective, to use as prescribed
- Teach patient not to receive live vaccinations during treatment
- Teach patient to notify prescriber of possible infection (upper respiratory or other) or allergic reactions
- How to use pen and inj techniques and proper disposable

### Evaluation

- Decreasing plaque psoriasis

S

## selegiline (Rx)

(se-le′ji-leen)
**Eldepryl, Emsam, Zelapar**
*Func. class.:* Antiparkinson agent
*Chem. class.:* MAOI, type B

**Do not confuse:** selegiline/Salagen
Zelapar/ZyPREXA

**ACTION:** Increased dopaminergic activity by inhibition of MAO type B activity; not fully understood

**Therapeutic outcome:** Decreased symptoms of Parkinson's disease

**USES:** Adjunct management of Parkinson's disease in patients being treated with levodopa/carbidopa who have responded poorly to therapy, depression (transdermal)

**Unlabeled use:** Alzheimer's disease, depression

## CONTRAINDICATIONS

Children/adolescents (suicide/hypertensive crisis), hypersensitivity, breastfeeding, MAOIs

**Precautions:** Pregnancy, abrupt discontinuation, alcoholism, ambient temperature increases, behavioral changes, bipolar disorders, driving or operating machinery, geriatrics, heating pad, hepatic disease, hypertension, hypotension, melanoma, phenylketonuria, psychosis, renal disease, sunlight exposure

**BLACK BOX WARNING:** Children or adolescents (transdermal)

**BLACK BOX WARNING:** Suicidal ideation

## DOSAGE AND ROUTES

**Adult: PO** 10 mg/day in divided doses, 5 mg at breakfast and lunch with levodopa/carbidopa; after 2-3 days begin to reduce the dose of levodopa/carbidopa 10%-30%; **oral disintegrating tab** 1.25 mg (1 tab) initially, then 2.5 (2 tabs) dissolved on tongue daily before breakfast × 6 wk or more; max 2.5 mg/day; **transdermal** 6 mg/24 hr initially, increase by 3 mg/24 hr at ≥2 wk, up to 12 mg/24 hr if needed

### Alzheimer's disease (unlabeled)

**Adult:** PO 5 mg bid AM, PM

**Available forms:** Tabs 5 mg, caps 5 mg; oral disintegrating tabs 1.25 mg; transdermal 6 mg/24 hr (20 mg/20 $cm^2$), 9 mg/24 hr (30 mg/30 $cm^2$), 12 mg/24 hr (40 mg/40 $cm^2$)

### Implementation

- Do not use in children due to risk for hypertensive crisis
- Adjust dosage to patient's response
- Give with meals; limit protein taken with product
- Give at doses <10 mg/day because of risks associated with nonselective inhibition of MAO
- **Oral disintegrating tab:** peel back foil, place tab on tongue, allow to dissolve, swallow with saliva, no fluids for 5 min before and after use; avoid using >2.5 mg/day, hypertensive crisis is more common

**Transdermal route**

- Apply to dry, intact skin on upper torso/thigh or outer surface of upper arm q24hr

**BLACK BOX WARNING:** Do not use in children <12 yr

- When using 9 mg/24 hr or 12 mg/24 hr specific manufacturer recommendations for tyramine intake must be followed to prevent hypertensive crisis

## ADVERSE EFFECTS

**CNS:** Increased tremors, chorea, restlessness, blepharospasm, increased bradykinesia, grimacing, tardive dyskinesia, dystonic symptoms, involuntary movements, increased apraxia, hallucinations, dizziness, mood changes, nightmares, delusions, lethargy, apathy, overstimulation, sleep disturbances, headache, migraine, numbness, muscle cramps, confusion, anxiety, tiredness, vertigo, personality change, back/leg pain, suicide in children/adolescents, suicidal ideation in adults
**CV:** Orthostatic hypotension, hypertension, dysrhythmia, palpitations; angina pectoris, hypotension, edema, sinus bradycardia, syncope, hypertensive crisis (children)
**EENT:** Diplopia, dry mouth, blurred vision, tinnitus
**GI:** *Nausea,* weight loss, anorexia, diarrhea
**GU:** Slow urination, nocturia, prostatic hypertrophy, hesitation, retention, frequency, sexual dysfunction
**INTEG:** Increased sweating, alopecia, hematoma, rash, photosensitivity, facial hair
**RESP:** Asthma, shortness of breath

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed |
| **Metabolism** | Rapidly, liver |
| **Excretion** | Metabolites *N*-desmethyldeprenyl, amphetamine, methamphetamine |
| **Half-life** | 10 hr; oral disintegrating tab 1.3 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | ½-2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Dextromethorphan: increased unusual behavior, psychosis

FLUoxetine, fluvoxaMINE, PARoxetine, sertraline: increased serotonin syndrome (confusion, seizures, fever, hypertension, agitation) discontinue 5 wk before selegiline

Levodopa/carbidopa: increased side effects

Meperidine: do not use, fatal reaction

### Drug classifications

Antidepressants (tricyclics), opioids (especially meperidine): do not use, fatal reaction

Antihypertensives: increased hypotension

### Drug/lab test

Decreased: VMA

False positive: urine ketones, urine glucose

False negative: urine glucose (glucose oxidase)

False increase: uric acid, urine protein

## NURSING CONSIDERATIONS

### Assessment

- Monitor cardiac status: tachycardia, bradycardia; B/P, respiration throughout treatment

**BLACK BOX WARNING:** Assess mental status: affect, mood, behavioral changes, depression; perform suicide assessment, suicidal ideation may occur

- **Parkinson's symptoms:** assess for rigidity, unsteady gait, weakness, tremors; these should decrease in severity
- Assess opioids; if patient has received, do not give selegiline; fatal reactions have occurred
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed, excretion unknown
- **Orthostatic hypotension:** May occur during first few weeks of use, more frequent in those >60 yr
- **Suicidal ideation:** Report change in symptoms, worsening depression, or suicidal thoughts/behaviors, treatment may need to be changed

### Patient/family education

- Caution patient to change positions slowly to prevent orthostatic hypotension
- **Hypertensive crisis:** teach patient to report nausea, vomiting, sweating, agitation, change in mental status, headache, chest pain to prescriber immediately
- **Pregnancy:** teach patient to report if pregnancy is planned or suspected, do not breastfeed
- Teach patient to use during the day to prevent insomnia
- Caution patient to use product exactly as prescribed; if product is discontinued abruptly, parkinsonian crisis may occur
- Instruct patient to avoid foods high in tyramine: cheese, pickled products, wine, beer, large amounts of caffeine as per manufacturer
- Instruct patient not to exceed recommended dose of 10 mg; might precipitate a hypertensive crisis; report severe headache or other unusual symptoms
- **Serotonin syndrome:** teach patient to report twitching, sweating, shivering, diarrhea to prescriber immediately
- Teach patient to avoid heating pads, hot tubs when using transdermal products
- Teach patient to avoid hazardous activities until response is known

### Evaluation

**Positive therapeutic outcome**

- Decreased symptoms of Parkinson's disease

## TREATMENT OF OVERDOSE:

**IV** fluids for hypertension, **IV** dilute pressure agent for B/P titration

## selenium topical

*See Appendix B*

## sertraline (Rx)

(ser'tra-leen)

**Zoloft**

*Func. class.:* Antidepressant

*Chem. class.:* Selective serotonin reuptake inhibitor (SSRI)

**Do not confuse:** Zoloft/Zocor

**ACTION:** Inhibits serotonin reuptake in CNS, thus increasing action of serotonin; does not affect DOPamine, norepinephrine

**Therapeutic outcome:** Relief of depression, obsessive-compulsive disorder (OCD), posttraumatic stress disorder (PTSD), panic disorder

**USES:** Major depression, OCD, PTSD, social anxiety disorder, panic disorder, premenstrual dysphoric disorder (PMDD), separation anxiety disorder

## CONTRAINDICATIONS

Hypersensitivity to this product or selective serotonin reuptake inhibitors

**Precautions:** Pregnancy, breastfeeding, geriatric, renal/hepatic disease, epilepsy, recent MI, latex sensitivity (dropper of oral conc)

**BLACK BOX WARNING:** Suicidal ideation, children

## DOSAGE AND ROUTES

### Major depression/OCD

**Adult/geriatric:** PO 25-50 mg/day; may increase to a maximum of 200 mg/day, do not change dose at intervals of <1 wk; administer daily in AM or PM

**Child 6-12 yr (unlabeled):** PO 25 mg/day, max 200 mg/day

### Premenstrual disorders

**Adult:** PO 50-150 mg nightly

### Social anxiety disorder

**Adult:** PO 25 mg qday, may increase by 50 mg qday after 7 days, range 50-200 mg/day

### Hepatic dose

**Adult:** PO; use lower dose or less frequent dosing intervals

**Available forms:** Tabs 25, 50, 100 mg; oral sol 20 mg/ml

### Implementation

- Administer dosage at bedtime if oversedation occurs during day; may take entire dose at bedtime; may crush
- Give with food, milk for GI symptoms
- Give crushed if patient is unable to swallow medication whole
- Use sugarless gum, hard candy; frequent sips of water for dry mouth
- **Oral concentration:** dilute before use with 4 oz (½ cup) of water, orange juice, ginger ale, or lemon/lime soda; do not mix with other liquids
- Store at room temperature; do not freeze
- Dropper contains latex

## ADVERSE EFFECTS

**CNS:** *Insomnia, agitation, somnolence, dizziness, headache, tremor, fatigue,* paresthesia, twitching, confusion, ataxia, gait abnormality (geriatric), seizures, neuroleptic malignant syndrome–like reactions, serotonin syndrome, suicidal ideation, anxiety, drowsiness
**CV:** Palpitations, chest pain
**EENT:** Vision abnormalities, yawning, tinnitus, intraocular pressure
**ENDO:** Syndrome of inappropriate antidiuretic hormone (geriatric), diabetes mellitus
**GI:** *Diarrhea, nausea, constipation, anorexia, dry mouth,* dyspepsia, *vomiting, flatulence,* weight gain/loss, hepatitis
**GU:** *Male sexual dysfunction,* micturition disorder
**INTEG:** Increased sweating, rash, hot flashes
**MISC:** Hyponatremia, neonatal abstinence syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Unknown, steady state 1 wk |
| **Metabolism** | Liver, extensively |
| **Excretion** | Feces (14%) |
| **Half-life** | 26 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 4.5-8.4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Cimetidine, warfarin: increased sertraline effect
CloZAPine: increased effects of cloZAPine
Diazepam: increased diazepam effect
Disulfiram: disulfiram reaction with oral conc due to alcohol content
Lithium: altered lithium levels
Phenytoin: increased effects of phenytoin
Pimozide: sertraline is contraindicated with pimozide, fatal reactions, avoid concurrent use
Sibutramine, traZODone, busPIRone, linezolid, traMADol: increased serotonin syndrome, increased neuroleptic malignant syndrome
SUMAtriptan: increased SUMAtriptan effects
TOLBUTamide: increased effect of TOLBUTamide
Warfarin: increased warfarin effect

### Drug classifications

Anticoagulants, NSAIDs, thrombolytics, platelet inhibitors, salicylates: increased bleeding risk
Antidepressants (tricyclics), benzodiazepines: increased effect
Highly protein-bound products: increased sertraline levels
SSRIs, SNRIs, serotonin-receptor agonists, tricyclics: increased serotonin syndrome, increased neuroleptic malignant syndrome, avoid concurrent use
MAOIs: fatal reactions

### Drug/herb

Kava, valerian: increased CNS effect

SAM-e, St. John's wort, tryptophan: increased effect of SSRIs, serotonin syndrome; do not use together

### Drug/lab test

Increased: AST, ALT
False positive: urine screen for benzodiazepines

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Assess mental status:** mood, sensorium, affect, suicidal tendencies (child/young adult); increase in psychiatric symptoms: depression, panic attacks, OCD, PTSD, social anxiety disorder, usually occurs in first few months of treatment

- Identify alcohol consumption; if alcohol is consumed, hold dose until AM
- **Serotonin syndrome:** assess for hyperthermia, hypertension, rigidity, delirium, coma, myoclonus or neuroleptic malignant-like syndrome (muscle cramps, fever, unstable B/P, agitation, tremors, mental changes)
- **Bleeding (platelet serotonin depletion):** assess for GI bleeding, ecchymoses, epistaxis, hematomas, petechiae, hemorrhage)
- LFTs, thyroid function test, growth rate, weight baseline and periodically
- **Hypertension:** B/P (lying/standing), pulse q4hr; if systolic B/P drops 20 mm Hg, hold product, notify prescriber; VS q4hr in patients with CV disease
- Weight qwk; appetite may decrease with product
- Urinary retention, constipation, especially in geriatric patients
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, serious complications may occur in the neonate, cautious use in breastfeeding, excretion unknown
- **Beers:** Avoid in older adults unless safer alternatives are not available, may cause ataxia, impaired psychomotor function

### Patient/family education

- Teach patient that therapeutic effects may take 1 wk or longer
- Instruct patient to notify prescriber if pregnant or planning to become pregnant or breastfeed, pregnancy
- Instruct patient to use caution in driving or other activities requiring alertness because of drowsiness, dizziness, blurred vision; to avoid rising quickly from sitting to standing, especially geriatric
- Advise patient to avoid alcohol ingestion, other CNS depressants
- **Teach patient not to discontinue medication quickly after long-term use:** may cause nausea, headache, malaise
- Caution patient to wear sunscreen or large hat because photosensitivity can occur
- Teach patient to increase fluids, bulk in diet if constipation, urinary retention occur, especially geriatric
- Instruct patient to take gum, hard sugarless candy, or frequent sips of water for dry mouth
- Teach patient that medication may be taken without regard to food
- **Serotonin syndrome:** teach patient to report agitation, nausea, vomiting, diarrhea, twitching, sweating, shivering to prescriber immediately

**BLACK BOX WARNING: Suicidal ideation:** Teach patient that suicidal thoughts/behavior may occur (children/adolescents)

### Evaluation

**Positive therapeutic outcome**

- Decrease in depression, OCD
- Absence of suicidal thoughts

## TREATMENT OF OVERDOSE:

ECG monitoring, induce emesis, lavage, administer anticonvulsant

## sildenafil (Rx)

(sil-den'a-fill)
**Revatio, Viagra**
*Func. class.:* Erectile agent; antihypertensive, pulmonary vasodilator
*Chem. class.:* Selective inhibitor of cyclic GMP-PDE5

S

**Do not confuse:** Viagra/Allegra

**ACTION:** Enhances the effect of nitric oxide (NO) by inhibiting phosphodiesterase type 5 (PDE5), which is necessary for degrading cyclic GMP in the corpus cavernosum

**Therapeutic outcome:** Ability to achieve and maintain erection

**USES:** Treatment of erectile dysfunction, pulmonary hypertension; improvement in exercise ability

**Unlabeled uses:** Sexual dysfunction (women)

## CONTRAINDICATIONS

Hypersensitivity to this product or nitrates

**Precautions:** Pregnancy, anatomical penile deformities, sickle cell anemia, leukemia, multiple

myeloma, retinitis pigmentosa, bleeding disorders, active peptic ulceration, CV/renal/hepatic disease, multidrug antihypertensive regimens, geriatric patients

## DOSAGE AND ROUTES

### Erectile dysfunction (Viagra only)

**Adult male <65 yr:** PO 50 mg 1 hr before sexual activity; may be increased to 100 mg or decreased to 25 mg; max frequency once/day
**Adult ≥65 yr (male):** PO 25 mg prn about 1 hr before sexual activity

### Renal/hepatic dose

**Adult:** PO (Child-Pugh A, B) 25 mg, take 1 hr before sexual activity, do not use more than 1 ×/day; CCr <30 ml/min 25 mg starting dose

### Pulmonary hypertension (Revatio only)

**Adult:** PO 20 mg tid, take 4-6 hr apart; **IV** BOL 10 mg tid

**Available forms:** Tabs 20, 25, 50, 100 mg, sol for inj 10 mg/12.5 ml

### Implementation

- **Erectile dysfunction:** give approximately 1 hr before sexual activity, do not use more than once a day, give on empty stomach for better absorption
- Tab may be split
- **Pulmonary hypertension:** Give 3×/day, 4-6 hr apart

## ADVERSE EFFECTS

**CNS:** *Headache, flushing, dizziness,* transient global amnesia, seizures
**CV:** MI, sudden death, CV collapse, TIAs, ventricular dysrhythmias, CV hemorrhage
**MISC:** *Dyspepsia, nasal congestion, UTI, abnormal vision, diarrhea, rash,* NAION (nonarteritic ischemic optic neuropathy), hearing loss, priapism, sickle cell crisis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly, bioavailability (40%) |
| **Distribution** | Unknown |
| **Metabolism** | Liver (active metabolites) |
| **Excretion** | Feces, urine |
| **Half-life** | 4 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | ½-1½ hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol, amLODIPine: decreased B/P
Bosentan, rifampin, carBAMazepine, dexamethasone, phenytoin, nevirapine, rifabutin, troglitazone: decreased sildenafil levels
Cimetidine, erythromycin, itraconazole, ketoconazole, tacrolimus: increased sildenafil levels
Riociguat: Fatal fall in B/P, do not use together

### Drug classifications

Antacids, barbiturates, CYP450 inducers: decreased sildenafil levels
Antiretroviral protease inhibitors: increased sildenafil levels
α-Blockers, angiotensin II receptor blockers: decreased B/P
Nitrates: fatal fall in B/P; do not use together

### Drug/food

Grapefruit: increased product effect
High-fat meal: decreased absorption

## NURSING CONSIDERATIONS

### Assessment

- **Phosphodiesterase type 5 inhibitors with lopinavir/ritonavir (Kaletra):** assess for hypotension, visual changes, prolonged erection, syncope; give only 25 mg q48hr and monitor for adverse reactions
- For erectile dysfunction before use (Viagra), question about whether failure to achieve erection or failure to maintain intercourse, anorgasmia
- Identify organic nitrates that should not be used with this product
- Assess for any severe loss of vision while taking this or any similar products; these products should not be used if vision loss has occurred
- **Assess for MI, sudden death, CV collapse:** Those with an MI within 6 mo, resting hypotension <90/50, resting hypertension >170/100, fluid depletion should use this product cautiously, may occur right after sexual activity to days afterward
- **Sickle cell crisis (vasoocclusive crisis):** when used for pulmonary hypertension, may require hospitalization
- Cardiac status, hemodynamic parameters, exercise tolerance in pulmonary hypertension: B/P pulse (Revatio)
- **Pregnancy/breastfeeding:** Not indicated for women (Viagra), unknown in pulmonary hypertension, cautious use in breastfeeding (Revatio)

### Patient/family education
- Teach patient that product does not protect against STDs, including HIV
- Teach patient that product absorption is reduced with a high-fat meal, to take on empty stomach for faster absorption, to take 30 min to 4 hr before sexual activity, peak in 2 hr
- Teach patient that product should not be used with nitrates in any form or soluble guanylate cyclase stimulators (pulmonary hypertension: Riociguat)
- Teach patient that tab may be split
- Teach patient to notify prescriber immediately and stop taking product if vision loss occurs
- Do not use more often than 100 mg in 24 hr
- Teach patient to notify prescriber immediately and to stop taking product if vision/hearing loss occurs or erection lasts >4 hr
- Teach patient to use only as directed
- Advise patient that color change that is visualized may change

### Evaluation
**Positive therapeutic outcome**
- Ability to achieve and maintain an erection

## silodosin (Rx)
(si-lo′do-seen)
**Rapaflo**
*Func. class.:* Selective $\alpha_1$-adrenergic blocker, BPH agent
*Chem. class.:* Sulfamoylphenethylamine derivative

**ACTION:** Binds preferentially to $\alpha_{1A}$-adrenoceptor subtype located mainly in the prostate

**Therapeutic outcome:** Decreased symptoms of benign prostatic hyperplasia

**USES:** Symptoms of benign prostatic hyperplasia (BPH)

## CONTRAINDICATIONS
Hypersensitivity, renal failure, hepatic disease

**Precautions:** Pregnancy breastfeeding, children, renal/hepatic disease, females, hypotension, ocular surgery, orthostatic hypotension, prostate cancer, syncope, geriatric patients

## DOSAGE AND ROUTES
**Adult:** PO 8 mg/day with a meal; max 8 mg/day

### Renal dose
**Adult:** PO CCr 30-49 ml/min 4 mg/day; CCr <30 ml/min not recommended

**Available forms:** Tabs 8 mg

### Implementation
- Give with meal at same time of day
- Store at room temperature; protect from light and moisture

## ADVERSE EFFECTS
**CNS:** *Dizziness, headache,* asthenia, insomnia, syncope
**CV:** Orthostatic hypotension
**EENT:** Nasal congestion, rhinorrhea, sinusitis
**GI:** Diarrhea, abdominal pain, jaundice
**GU:** *Abnormal ejaculation,* priapism, urinary incontinence
**HEMA:** Purpura

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Decreased with high-fat/high-calorie meal |
| **Distribution** | Extensive protein binding 97% |
| **Metabolism** | Liver |
| **Excretion** | Urine |
| **Half-life** | 24 hr (metabolite) |

### Pharmacodynamics
Unknown

## INTERACTIONS
### Drug classifications
CYP3A4 inhibitors (clarithromycin, itraconazole, ritonavir, anti-retroviral protease inhibitors, aprepitant, chloramphenicol, conivaptan, dalfopristin, danazol, delavirdine, efavirenz, fosaprepitant, fluconazole, fluvoxaMINE, imatinib, isoniazid, mifepristone, nefazodone, tamoxifen, telithromycin, troleandomycin, voriconazole, zileuton, zafirlukast): increased silodosin effect

### Drug/food
Grapefruit juice: increased silodosin effect

### Drug/lab test
Increased: LFTs

## NURSING CONSIDERATIONS
### Assessment
- **Prostatic hyperplasia:** assess for change in urinary patterns, baseline and throughout treatment, testing for prostate cancer prior to administration is recommended
- Monitor BUN, uric acid, urodynamic studies (urinary flow rates, residual volume), CCr, contraindicated in CCr <30 ml/min
- Assess I&O ratios, weight daily, edema, report weight gain or edema
- B/P, monitor for orthostatic hypotension
- **Pregnancy/breastfeeding:** Not indicated for women

### Patient/family education

- Caution patient not to drive or operate machinery until effect is known
- Advise patient not to use with grapefruit juice
- Teach patient to take with same meal each day, contents of capsule may be sprinkled on room-temperature applesauce if used within 5 min, follow with 8 oz of water

### Evaluation

**Positive therapeutic outcome**

- Decreased symptoms of benign prostatic hyperplasia

## simeprevir

(sim-e′pre-vir)

**Olysio**

*Chem. class.:* NS3/4A protease inhibitor

*Func. class.:* Antiviral, antihepatitis agent

**ACTION:** Prevents formation of mature viral proteins by inhibiting hepatitis C viral (HCV) replication by blocking proteolytic activity of the hepatitis C virus NS3/4A protease

**Therapeutic outcome:** Decreased symptoms of chronic hepatitis C

**USES:** Chronic hepatitis C infection, hepatitis, (HCV, genotype 1) in adults with compensated liver disease

## CONTRAINDICATIONS

Hypersensitivity, male-mediated teratogenicity, pregnancy in combination

**Precautions:** Pregnancy (alone), breastfeeding, Asian patients, liver transplant, UV exposure, hepatic disease, serious rash, children, hepatitis C and HIV coinfection

## DOSAGE AND ROUTES

### For the treatment of chronic hepatitis C infection, genotype 1, in patients with compensated liver disease

**Adult:** PO (with sofosbuvir) Treatment-naive and experienced: 150 mg q day with sofosbuvir X 12 wks (without cirrhosis), 24 wks (with cirrhosis); never give as monotherapy. If sofosbuvir is discontinued for any reason, then simeprevir must also be discontinued.

**Adult:** PO (with peginterferon alfa and ribavirin) Treatment-naive and prior relapse adults with or without cirrhosis (Child-Pugh A) who are HIV-negative 150 mg q day with peginterferon alfa and ribavirin, for an initial 12 wks; never administer simeprevir as monotherapy. After the initial 3-drug regimen, give an additional 12 wks of only peginterferon alfa and ribavirin (24 wks for total course); Treatment-naive and prior relapse adults with HIV coinfection and cirrhosis (Child-Pugh A) 150 mg q day with peginterferon alfa and ribavirin, for an initial 12 wks of treatment; never administer simeprevir as monotherapy. After the initial 3-drug regimen, give an additional 36 wks of only peginterferon alfa and ribavirin (48 wks for total course); Adult prior nonresponders (including partial and null responders) with or without cirrhosis (Child-Pugh A) and with or without HIV coinfection 150 mg q day with peginterferon alfa and ribavirin, for an initial 12 wks; never give simeprevir as monotherapy. After the initial 3-drug regimen, give an additional 36 wks of only peginterferon alfa and ribavirin (48 wks for total course).

### For the treatment of chronic hepatitis C infection, genotype 4, in patients with compensated liver disease

**Adult:** PO Treatment-naive and prior relapse adults with or without cirrhosis (Child-Pugh A) who are HIV-negative 150 mg q day with peginterferon alfa and ribavirin for an initial 12 wks; never administer simeprevir as monotherapy. After the initial 3-drug regimen, give an additional 12 wks of only peginterferon alfa and ribavirin (24 wks for total course): Treatment-naive and prior relapse adults with HIV coinfection but without cirrhosis 150 mg q day with peginterferon alfa and ribavirin for an initial 12 wks; never administer simeprevir as monotherapy. After the initial 3-drug regimen, give an additional 12 wks of only peginterferon alfa and ribavirin (24 wks for total course).

Treatment-naive and prior relapse adults with HIV coinfection and cirrhosis (Child-Pugh A) 150 mg q day with peginterferon alfa and ribavirin for an initial 12 wks of treatment; never give simeprevir as monotherapy. After the initial 3-drug regimen, give an additional 36 wks of only peginterferon alfa and ribavirin (48 wks for total course); Adult prior nonresponders (including partial and null responders) with or without cirrhosis (Child-Pugh A) and with or without HIV coinfection

150 mg q day with peginterferon alfa and ribavirin for an initial 12 wks; never administer simeprevir as monotherapy. After the initial 3-drug regimen, give an additional 36 wks of

only peginterferon alfa and ribavirin (48 wks for total course).

**For the treatment of recurrent hepatitis C infection in patients after liver transplantation (unlabeled), including those with compensated cirrhosis**

**Adult:** PO 150 mg q day with sofosbuvir with or without ribavirin for 12 to 24

### Hepatic disease

No dosage adjustments are needed for mild hepatic impairment (Child-Pugh Class A). Avoid use in patients with moderate or severe hepatic impairment (Child-Pugh Class B or C

**Available forms:** Cap 150 mg

### Implementation

- Give by mouth with food, swallow whole
- Do not use monotherapy; if peginterferon alfa or ribavirin is discontinued, discontinue simeprevir and do not restart
- Obtain NS3 Q80K polymorphism test before starting treatment
- Treatment-naïve/prior relapse: after initial 3-drug treatment, give another 12 wk with peginterferon alfa and ribavirin × another 12 wk; if HCV RNA concentrations ≥25 interstitial units/ml, discontinue all 3 drugs
- Prior nonresponders (partial/null): after initial 3-drug treatment give an additional 36 wk of peginterferon alfa and ribavirin; monitor HCV RNA at wk 4, 12, 24; if ≥25 interstitial units/ml, discontinue products

## ADVERSE EFFECTS

**EENT:** Blurred vision, conjunctivitis
**GI:** Hyperbilirubinemia, nausea, hepatotoxicity
**INTEG:** Exfoliative dermatitis, pruritus, *photosensitivity*, vasculitis
**MISC:** *Rash, dyspnea, myalgia, pruritus*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 99.9 % protein binding |
| **Metabolism** | Primarily by CYP3A4, also a mild inhibitor of intestinal CYP3A4 and CYP1A2 |
| **Excretion** | 91% feces |
| **Half-life** | 40 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Bromocriptone, chloramphenicol, cimetidine, dalfopristin/quinupristin, danazol, erythromycin, FLUoxetine, isoniazid, lanreotide, octreotide, zafirlukast: increased simeprevir effect

### Drug/herb

Increase: Simeprevir effect: milk thistle

### Drug classifications

CYP3A4 inhibitors (clarithromycin, cobicistat, delavirdine, darunavir/ritonavir, erythromycin, fluconazole, posaconazole, ritonavir, telithromycin, voriconazole): increased effects of these agents

### Drug/Lab

Increase: Bilirubin, alkaline phosphatase amylase
CYP3A4 inducers (carBAMazepine, dexamethasone, PHENobarbital, OXcarbazepine, phenytoin, rifAMPin, efavirenz, etravirine)
Decrease: Simeprevir effect

## NURSING CONSIDERATIONS

### Assessment

- Allergic reaction: assess for rash, pruritus, exfoliative dermatitis, assess for sulfa allergy, contains sulfa
- **Asian patients:** levels may be 3-fold to 4-fold higher
- **Pregnancy:** if planned or suspected; if pregnant call the Pregnancy Registry 800-258-4263, obtain pregnancy test before using do not use in pregnancy
- Liver function tests: Monitor HCV, RNA concentrations at weeks 4, 12, and 24 and at end of treatment; if bilirubin is 2.5 times UNL and other LFTs are increased, discontinue treatment
- HBV reactivation: Test required before beginning treatment, monitor throughout treatment
- HCV infection: Test for HCV; if phenotype 1a or being treated with peg-interferon alfa and HBV, test for N53Q80K, if positive do not use

**BLACK BOX WARNING:** Hepatitis B exacerbation: Assess for liver toxicity, yellow eyes, skin, fatigue, weakness, anorexia, nausea, vomiting, clay-colored stools

### Patient/family education

- Teach patient that optimal duration of treatment is unknown, that product is not a cure, that transmission may still occur
- Teach patient to avoid use with other medications unless approved by prescriber
- Teach patient to use protective clothing, sunscreen; photosensitivity may occur and can be severe

S

• Teach patient not to stop abruptly unless directed; worsening of hepatitis may occur
• Teach patient to notify prescriber if pregnancy is planned or suspected, avoid breastfeeding; use 2 reliable forms of contraception, do not try to conceive for at least 6 mo after discontinuation of this drug combination
• Teach patient to use cautiously in sulfonamide allergy; do not take the drug as single agent; must use as combination therapy
• Teach patient to report rash, swelling of face, lips, mouth sores, poor appetite, yellow eyes or skin

### Evaluation

**Positive therapeutic outcome**
• Decreased symptoms of chronic hepatitis C

## silver nitrate 1% ophthalmic
*See Appendix B*

## silver nitrate sulfacetamide sodium ophthalmic
*See Appendix B*

## silver sulfADIAZINE topical
*See Appendix B*

## RARELY USED

## simethicone (Rx, OTC)
(si-meth'i-kone)
**Barriere, Gas Relief, Gas-Relief, Gas-X, Mylanta Gas, Mylanta Gas Relief, Mylicon, Ovol, Phazyme**
*Func. class.:* Antiflatulent

**USES:** Flatulence

### CONTRAINDICATIONS
Hypersensitivity, GI obstruction/perforation

### DOSAGE AND ROUTES
**Adult and child >12 yr:** PO 40-125 mg after meals and at bedtime prn, max 500 mg/day
**Child 2-12 yr:** PO 40 mg after meals and at bedtime prn, max 240 mg/day
**Child <2 yr:** PO 20 mg qid prn

## simvastatin (Rx)
(sim-va-stat'in)
**Zocor**
*Func. class.:* Antilipidemic
*Chem. class.:* HMG-CoA reductase inhibitor

**Do not confuse:** Zocor/Cozaar/Zoloft

**ACTION:** Inhibits HMG-CoA reductase enzyme, which reduces cholesterol synthesis; this enzyme is needed for cholesterol production

**Therapeutic outcome:** Decreasing cholesterol levels and LDLs, increased HDLs

**USES:** As an adjunct in primary hypercholesterolemia (types IIa, IIb), isolated hypertriglyceridemia (Frederickson type IV) and type III hyperlipoproteinemia, CAD, heterozygous familial hypercholesterolemia; MI/stroke prophylaxis

### CONTRAINDICATIONS
Pregnancy, breastfeeding, hypersensitivity, active liver disease

**Precautions:** Past liver disease, alcoholism, severe acute infections, trauma, severe metabolic disorders, electrolyte imbalances, Chinese patients

### DOSAGE AND ROUTES
**Adult:** PO 20-40 mg/day in PM initially, usual range 5-40 mg/day daily in PM max, 40 mg/day for most patients; max 80 mg/day (for patients taking 80 mg/day chronically without myopathy); dosage adjustments may be made at 4-wk intervals or more; those taking verapamil and amiodarone max 20 mg/day, max <80 mg for Chinese patients taking lipid-modifying niacin doses

#### With diltiazem/verapamil
**Adult:** PO 5-10 mg q PM, max 10 mg/day with amiodarone/amLODIPine/ranolazine
**Adult:** PO 5-20 mg q PM, max 20 mg/day
**Child and adolescent ≥10 yr including girls ≥1 yr postmenarche:** PO 10 mg q PM, range 10-40 mg/day

#### With amiodarone, amLODIPine, ranolazine
**Adult:** PO 5-20 mg/day in evening, max 20 mg/day

#### Heterozygous familial hypercholesterolemia
**Adult:** PO 40 mg qday in evening; make dosage adjustments q4wk

**Heterozygous familial hypercholesterolemia in boys and postmenarchal girls**
**Child 10-17 yr:** PO 10 mg qday in the evening, max 40 mg/day

**Renal dose**
**Adult:** PO 5 mg qday in the evening (severe renal disease)

**Available forms:** Tabs 5, 10, 20, 40, 80 mg

### Implementation
- Give 30 min before AM and PM meals
- Store in cool environment in tight container protected from light
- Discontinuing use before surgery is recommended in renal failure, restart afterward

## ADVERSE EFFECTS
**CNS:** Headache, cognitive impairment
**GI:** Nausea, constipation, diarrhea, dyspepsia, flatus, abdominal pain, liver dysfunction, pancreatitis, hyperglycemia
**INTEG:** Rash, pruritus
**MS:** Muscle cramps, myalgia, myositis, rhabdomyolysis, myopathy
**RESP:** Upper respiratory tract infection

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 85% |
| **Distribution** | Unknown |
| **Metabolism** | Liver—extensively |
| **Excretion** | 70% feces, 20% kidneys |
| **Half-life** | 3 hr |

### Pharmacodynamics
Unknown

## INTERACTIONS
### Individual drugs
Clarithromycin, clofibrate, cycloSPORINE, erythromycin, gemfibrozil, itraconazole, ketoconazole, niacin, danazol, delavirdine, nefazodone, verapamil, diltiazem, amiodarone, azole antifungals, telithromycin: increased myalgia, myositis, rhabdomyolysis
CycloSPORINE, gemfibrozil: do not use with simvastatin
Digoxin: increased digoxin levels
Warfarin: increased risk of bleeding

### Drug classifications
Macrolide antiinfectives, protease inhibitors: increased myalgia, myositis, rhabdomyolysis
Increased: simvastatin effect ATP1B1 inhibitors

### Drug/herb
Red yeast rice, kava; eucalyptus: increased simvastatin effect
St. John's wort: decreased effect

### Drug/food
Increased: simvastatin level: grapefruit juice (large amounts)

### Drug/lab test
Increased: CPK, liver function tests, HbA1C, ALT/AST

## NURSING CONSIDERATIONS
### Assessment
- Assess nutrition: fat, protein, carbohydrates; nutritional analysis should be completed by dietitian before treatment is initiated
- **Rhabdomyolysis:** assess for muscle tenderness, increased CPK levels 10× ULN; therapy should be discontinued, more likely in those receiving >80 mg/day, first year of treatment, those ≥65 yr, females
- **Chinese patients:** Avoid high doses (80 mg) if taking niacin >1 g/day, may increase myopathy
- Monitor bowel pattern daily; diarrhea may be a problem
- Monitor triglycerides, cholesterol baseline, throughout treatment; LDL, HDL, triglycerides and cholesterol should be watched closely at 6-8 wk and q6mo; if increased, product should be discontinued

### Patient/family education
- Inform patient that compliance is needed for positive results to occur, not to double doses
- Advise patient to lower risk factors: high-fat diet, smoking, alcohol consumption, absence of exercise, smoking cessation
- Advise patient to notify prescriber of planned or suspected
- Teach patient to take in evening
- Teach patient to report muscle pain, weakness, abdominal pain, dark urine, yellowing of skin or eyes, memory loss

### Evaluation
**Positive therapeutic outcome**
- Decreased cholesterol levels, serum triglycerides and improved ratio with HDLs

**HIGH ALERT**

## sirolimus (Rx)
(seer-roe'li-mus)
**Rapamune**
*Func. class.:* Immunosuppressant
*Chem. class.:* Macrolide

**ACTION:** Produces immunosuppression by inhibiting T-lymphocyte activation and proliferation

**Therapeutic outcome:** Prevention of rejection in organ transplant

## USES:
Organ transplants: to prevent rejection, recommended use is with cycloSPORINE and corticosteroids

## CONTRAINDICATIONS
Breastfeeding, hypersensitivity to this product or to components of the product

**Precautions:** Pregnancy, children <13 yr, severe cardiac/renal/hepatic disease, diabetes mellitus, hyperkalemia, hyperuricemia, hypertension, interstitial lung disease, hyperlipidemia, soy lecithin hypersensitivity

**BLACK BOX WARNING:** Lymphomas, infection, other malignancies, liver/lung transplant, requires a specialized setting, requires an experienced clinician

## DOSAGE AND ROUTES
**Adult/adolescent ≥40 kg:** PO 2 mg daily with 6 mg loading dose
**Child >13 yr <40 kg (88 lb):** PO 1 mg/m$^2$/day, 3 mg/m$^2$/loading dose

### Hepatic dose
**Adult and child ≥13 yr <40 kg:** PO reduce by 33% in maintenance dose (mild to moderate hepatic impairment); reduce by 50% in maintenance dose (severe hepatic impairment)

**Available forms:** Oral sol 1 mg/ml; tabs 0.5, 1, 2 mg

### Implementation
- Administer prophylaxis for *Pneumocystis jiroveci* pneumonia for 1 yr after transplantation; prophylaxis for cytomegalovirus (CMV) is recommended for 90 days after transplantation in those at increased risk for CMV
- Use amber oral dose syringe and withdraw amount of oral sol needed from the bottle, empty correct dose into plastic/glass container holding 60 ml of water/orange juice, stir vigorously and have patient drink at once, refill container with additional 120 ml of water/orange juice, stir vigorously, and have patient drink at once; if using a pouch squeeze entire contents into container and follow preceding directions
- Give all medications PO if possible; avoid IM inj because bleeding may occur
- Give for 3 days before transplant surgery; patients should be placed in protective isolation, give at same time of day, give 4 hr after cycloSPORINE oral sol or caps, do not use with grapefruit juice
- Store protected from light; refrigerate; stable for 24 months

**BLACK BOX WARNING:** Only those experienced in immunosuppressant therapy and transplant should use this drug; must use in a specialized care setting with adequate medical equipment

## ADVERSE EFFECTS
**CNS:** *Tremors, headache, insomnia,* paresthesia, chills, fever
**CV:** Hypo/hypertension, atrial fibrillation, HF, palpitations, tachycardia, peripheral edema, thrombosis
**EENT:** Blurred vision, photophobia
**GI:** Nausea, vomiting, diarrhea, constipation, hepatotoxicity
**GU:** UTI, albuminuria, hematuria, proteinuria, renal failure, nephrotic syndrome
**HEMA:** Anemia, thrombocytopenia purpura, leukopenia, pancytopenia
**INTEG:** *Rash, acne,* photosensitivity
**META:** Increased creatinine, edema, hypercholesterolemia, *hyperlipemia,* hypophosphatemia, weight gain, hyperglycemia, hypo/hyperkalemia, hyperuricemia, hypomagnesemia, hypertriglyceridemia
**MS:** Arthralgia
**RESP:** Pleural effusion, atelectasis, *dyspnea,* pneumonitis, pulmonary embolism/fibrosis
**SYST:** Lymphoma, exfoliative dermatitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | 92% protein binding |
| **Metabolism** | Liver; extensively by CYP3A4 enzyme system |
| **Excretion** | Unknown |
| **Half-life** | 57-63 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1 hr single dose, 2 hr multiple dosing |
| **Duration** | Unknown |

## INTERACTIONS
### Individual drugs
Bromocriptine, cimetidine, cycloSPORINE, danazol, erythromycin, metoclopramide: increased blood level

CarBAMazepine, PHENobarbital, phenytoin, rifamycin, rifapentine: decreased blood levels

### Drug classifications

ACE inhibitors, angiotensin II receptor antagonists, cephalosporins, iodine-containing radiopaque contrast media, neuromuscular blockers, NSAIDs, penicillins, salicylates, thrombolytics: increased angioedema

Antifungal agents, calcium channel blockers, HIV protease inhibitors: increased blood levels

Live virus vaccines: decreased effect of vaccines

### Drug/herb

St. John's wort: decreased sirolimus effect

### Drug/food

Food: alters bioavailability, use consistently with or without food

Grapefruit juice: do not use with grapefruit juice

### Drug/lab test

Increased: LFTs, alk phos, lipids, triglycerides, total cholesterol, BUN, creatinine, LDH, phosphate

Decreased: platelets, sodium

Increased or decreased: magnesium, glucose, calcium

## NURSING CONSIDERATIONS

### Assessment

- **Wound dehiscence and anastomotic disruption:** assess wound, vascular, airway, ureteral, biliary, inhibition of growth factors; do not combine with corticosteroids, not recommended in lung or liver transplant

**BLACK BOX WARNING:** Infection: Immunosuppression may lead to susceptibility to infection

**BLACK BOX WARNING:** Neoplastic disease: Lymphoma, skin cancer may occur, limit UV exposure, use protective clothing, sunscreen not recommended, mortality and graft loss may occur

- **Anaphylaxis, angioedema, exfoliative dermatitis:** assess for, more common when given with ACE inhibitors; do not use if a hypersensitivity reaction occurs
- **Bone marrow suppression:** Hgb, WBC, platelets monthly during treatment; if leukocytes are $<3000/mm^3$ or platelets $<100,000/mm^3$, product should be discontinued or reduced; decreased Hgb level
- Monitor blood levels in those who may have altered metabolism, trough levels $\geq 15$ ng/ml are associated with increased adverse reactions
- **Pulmonary fibrosis, pulmonary effusion, pneumonitis:** assess for dyspnea, cough, hypoxia; some fatal cases have occurred
- Monitor lipid profile: cholesterol, triglycerides; a lipid-lowering agent may be needed

**BLACK BOX WARNING:** Creatinine/BUN, CBC, serum potassium

- Assess for infection and development of lymphoma
- Only those experienced in immunosuppressant therapy and organ transplantation should use this product; use only in renal transplant
- **High risk:** those with Banff grade 3 acute rejection or vascular rejection prior to cycloSPORINE withdrawal, dialysis dependent, creatinine >4.5 mg/dl, African descent, re-transplant, multiorgan transplant, high panel of reactive antibodies
- **Hepatotoxicity:** alk phos, AST, ALT, amylase, bilirubin: dark urine, jaundice, itching, light-colored stools; product should be discontinued

### Patient/family education

- Instruct patient to report fever, rash, severe diarrhea, chills, sore throat, fatigue because serious infections may occur; clay-colored stools, cramping may indicate hepatotoxicity; fever, chills, sore throat (infection)
- Caution patient to avoid crowds or persons with known infections to reduce risk of infection
- Teach patient to use contraception before, during, and 12 wk after product has been discontinued, avoid breastfeeding
- Teach patient to use sunscreen, protective clothing to prevent burns
- Teach patient that lifelong use is required to prevent rejection
- Teach patient that continuing follow-up exams and blood work will be required
- Teach patient not to get on skin
- Teach patient how to use product
- Teach patient to take at same time, consistently, with or without regard to food
- Teach patient to take 4 hr after oral cycloSPORINE when used for renal transplant

### Evaluation

**Positive therapeutic outcome**

- Absence of graft rejection

**⚠ HIGH ALERT**

## sitaGLIPtin (Rx)

(sit-a-glip'tin)

**Januvia**

*Func. class.:* Antidiabetic, oral

*Chem. class.:* Dipeptidyl-peptidase-4 inhibitor (DPP-4 inhibitor)

**ACTION:** Slows the inactivation of incretin hormones; improves glucose homeostasis, improves glucose-dependent insulin secretion, lowers glucagon secretions and slows gastric emptying time

**Therapeutic outcome:** Decrease in polyuria, polydipsia, polyphagia; clear sensorium; absence of dizziness; stable gait; blood glucose at normal level

**USES:** Type 2 diabetes mellitus as monotherapy or in combination with other antidiabetic agents

## CONTRAINDICATIONS

Angioedema, diabetic ketoacidosis (DKA)

**Precautions:** Pregnancy, geriatric, hypersensitivity, GI obstruction, thyroid disease, surgery, renal/hepatic disease, trauma, breastfeeding, pancreatitis, hypercortisolism, hyperglycemia, hyperthyroidism, hypoglycemia, ileus, pituitary insufficiency, surgery, type 1 diabetes mellitus, adrenal insufficiency, burns, diabetic ketoacidosis

## DOSAGE AND ROUTES

**Adult:** PO 100 mg/day; when used with a sulfonylurea or insulin

### Renal dose

**Adult:** PO CCr 30-50 ml/min 50 mg qd; CCr <30 ml/min 25 mg qd

**Available forms:** Tabs 25, 50, 100 mg

### Implementation

- May be taken with or without food
- Conversion from other antidiabetic agents; change may be made with gradual dosage change
- Store in tight container at room temperature
- Do not split, crush, chew, swallow whole

## ADVERSE EFFECTS

**CNS:** *Headache*
**ENDO:** Hypoglycemia
**GI:** *Nausea, vomiting,* abdominal pain, diarrhea, pancreatitis, constipation
**GU:** Acute renal failure
**MISC:** Peripheral edema
**SYST:** Anaphylaxis, Stevens-Johnson syndrome, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys, 79% unchanged |
| **Half-life** | Terminal 12.4 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

ARIPiprazole, cloZAPine, fosphenytoin, OLANZapine, phenytoin, QUEtiapine, risperiDONE, ziprasidone: decreased antidiabetic effect
Cimetidine, disopyramide: increased sitaGLIPtin level
Cimetidine, FLUoxetine: increased hypoglycemia
Digoxin: increased levels of digoxin

### Drug classifications

ACE inhibitors, estrogens, oral contraceptives, progestins, phenothiazines, protease inhibitors, sympathomimetics, thiazide diuretics: decreased antidiabetic effect
Androgens, β-blockers, corticosteroids, fibric acid derivatives, insulins, MAOIs, salicylates, sulfonylureas: increased hypoglycemia

### Drug/herb

Garlic, green tea, horse chestnut: increased antidiabetic effect

### Drug/lab test

Increased: creatinine, LFTs

## NURSING CONSIDERATIONS

### Assessment

- **Hypoglycemic reactions:** assess for sweating, weakness, dizziness, anxiety, tremors, hunger, hyperglycemic reactions soon after meals
- Monitor CBC (baseline, q3mo) during treatment; check liver function tests periodically, AST, LDH, renal studies: BUN, creatinine during treatment; Hgb A1c
- Monitor blood glucose (BG) as needed
- **Serious skin reactions:** assess for swelling of face, mouth, lips, dyspnea, wheezing
- **Pancreatitis:** assess for severe abdominal pain, nausea, vomiting; discontinue product
- **Renal studies:** monitor BUN, creatinine during treatment, especially in geriatrics or those with renal disease
- Monitor hemoglobin A1C; monitor blood glucose as needed

### Patient/family education

- Teach patient to use regular self-monitoring of blood glucose using blood glucose meter
- Teach patient the symptoms of hypo/hyperglycemia, what to do about each
- Teach patient that product must be continued on daily basis; explain consequence of discontinuing product abruptly
- Teach patient to notify prescriber if pregnancy is planned or suspected; to continue health regimen (diet, exercise)
- Advise patient to avoid OTC medications, alcohol, digoxin, exenatide, insulins, nateglinide, repaglinide, and other products that lower blood sugar, unless approved by prescriber
- Teach patient that diabetes is a lifelong illness; that this product is not a cure, only controls symptoms
- Teach patient that all food included in diet plan must be eaten to prevent hypo/hyperglycemia
- Teach patient to carry emergency ID
- Teach patient to notify prescriber immediately of hypersensitivity reactions (rash, swelling of face, trouble breathing)
- Advise patient to report severe joint pain immediately, may have a late onset

### Evaluation

**Positive therapeutic outcome**

- Decrease in polyuria, polydipsia, polyphagia; clear sensorium; absence of dizziness; stable gait, blood glucose, A1C improvement

## sodium bicarbonate (Rx, OTC)

**baking soda, Brosch-Neut, Citrocarbonate, Neut, Sellymin**

*Func. class.:* Alkalinizer; antacid

*Chem. class.:* $NaHCO_3$

**ACTION:** Orally neutralizes gastric acid, which forms water, NaCl, $CO_2$; increases plasma bicarbonate, which buffers $H^+$ ion concentration; reverses acidosis **IV**

**Therapeutic outcome:** Correction of acidosis, gastric acid neutralization

**USES:** Acidosis (metabolic), cardiac arrest, alkalinization (systemic/urinary); antacid (PO); salicylate poisoning

## CONTRAINDICATIONS

Respiratory/metabolic alkalosis, hypochloremia, hypocalcemia

**Precautions:** Pregnancy, HF, cirrhosis, toxemia, renal disease, hypertension, hypokalemia, breastfeeding, hypernatremia, Bartter's syndrome, Cushing's syndrome, hyperaldosteronism, children

## DOSAGE AND ROUTES

### Acidosis, metabolic (not associated with cardiac arrest)

**Adult and child:** **IV** INF 2-5 mEq/kg over 4-8 hr depending on $CO_2$, pH, ABGs

### Cardiac arrest

**Adult and child:** **IV** BOL 1 mEq/kg of 7.5% or 8.4% SOL, then 0.5 mEq/kg q5-10min, then doses based on ABGs

**Infant:** **IV** 1 mEq/kg over several min (use only the 0.5 mEq/ml [4.2%] sol for inj)

### Alkalinization of urine

**Adult:** PO 325 mg-2 g qid or 48 mEq/kg (4 g), then 12-24 mEq q4hr

**Child:** PO 84-840 mg/kg/day (1-10 mEq/kg), in divided doses q4-6hr

### Antacid

**Adult:** PO 300 mg-2 g chewed, taken with water daily-qid

**Available forms:** Tabs 300, 325, 600, 650 mg; inj 4.2%, 5%, 7.5%, 8.4%

### Implementation

**PO route**

- Antacid tab must be chewed and taken with 8 oz of water
- Dissolve effervescent tab in water
- May be used to neutralize gastric acid in peptic ulcer disease, given 1 and 3 hr after meals and at bedtime

**Direct IV route**

- Use in cardiac emergencies, use ampules or prefilled syringes only, give by rapid bolus dose, flush with 0.9% NaCl before and after use

**Continuous IV infusion route**

- Prepared sol or diluted in an equal amount of any dextrose/saline combination; administer 2-5 mEq/kg over 4-8 hr, max 50 mEq/hr; slower rate in children

**Y-site compatibilities:** Acyclovir, amifostine, asparaginase, aztreonam, bivalirudin, bumetanide, cefepime, cefmetazole, cefTRIAXone, chloramphenicol, cyclophosphamide, cytarabine, DAUNOrubicin, dexamethasone, DOXOrubicin, etoposide, famotidine, fentaNYL, filgrastim, fluconazole, fludarabine, furosemide, gallium nitrate, gemcitabine, gentamicin, granisetron, heparin, hydrocortisone sodium succinate, ifosfamide, indomethacin, insulin, ketorolac, labetalol, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, melphalan,

S

mesna, meperidine, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, milrinone, morphine, nafcillin, nitroglycerin, nitroprusside, PACLitaxel, palonosetron, pantoprazole, PEMEtrexed, penicillin G potassium, phenylephrine, phytonadione, piperacillin/tazobactam, potassium chloride, procainamide, propofol, propranolol, protamine, ranitidine, remifentanil, tacrolimus, teniposide, thiotepa, ticarcillin/clavulanate, tirofiban, tobramycin, tolazoline, vasopressin, vitamin B complex with C, voriconazole

**Y-site incompatibilities:** Allopurinol, amiodarone, amphotericin B, amphotericin B cholesteryl sulfate complex, ampicillin, anidulafungin, calcium chloride, calcium gluconate, caspofungin, cefotaxime, cefOXitin, cefuroxime, diazepam, diphenhydrAMINE, DOBUTamine, DOXOrubicin liposome, doxycycline, EPINEPHrine, fenoldopam, ganciclovir, haloperidol, hydrOXYzine, IDArubicin, imipenem/cilastatin, inamrinone, isoproterenol, lansoprazole, leucovorin, midazolam, nalbuphine, norepinephrine, ondansetron, phenytoin, prochlorperazine, promethazine, quinupristin/dalfopristin, sargramostim, trimethoprim/sulfamethoxazole, verapamil, vinCRIStine, vinorelbine

## ADVERSE EFFECTS

**CNS:** Irritability, headache, confusion, stimulation, tremors, *twitching, hyperreflexia,* tetany, weakness, seizures caused by alkalosis
**CV:** Irregular pulse, cardiac arrest, water retention, edema, weight gain
**GI:** Flatulence, *belching, distention*
**GU:** Calculi
**META:** *Alkalosis*
**MS:** Muscular twitching, tetany, irritability

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Widely distributed—extracellular fluids |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys |
| **Half-life** | Unknown |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | 2 min | Rapid |
| **Peak** | ½ hr | Rapid |
| **Duration** | 1-3 hr | Unknown |

## INTERACTIONS

### Individual drugs

ChlorproPAMIDE, lithium: decreased effect of each specific product
Flecainide, mecamylamine, pseudoephedrine, quiNIDine, quiNINE: increased effects of each specific product

### Drug classifications

Amphetamines, anorexiants, sympathomimetics: increased effects of each specific product
Barbiturates: decreased effects of barbiturates
Benzodiazepines: decreased effects of each specific product
Corticosteroids: increased sodium; decreased potassium, decreased effects of corticosteroids
Ketoconazoles: decreased effects of ketoconazoles
Salicylates: decreased effect of salicylates

### Drug/herb

Oak bark: decreased action of sodium bicarbonate

### Drug/lab test

Increased: sodium, lactate
Decreased: potassium

## NURSING CONSIDERATIONS

### Assessment

- Assess respiratory and pulse rate, rhythm, depth, lung sounds; notify prescriber of abnormalities
- Assess for $CO_2$ in GI tract; may lead to perforation if ulcer is severe
- **Fluid balance** (I&O ratio, weight daily, edema); notify prescriber of fluid overload, assess for edema, crackles, SOB
- Monitor electrolytes, blood pH, $PO_2$, $HCO_3$ during beginning treatment; ABGs frequently during emergencies
- Monitor extravasation with **IV** administration (tissue sloughing, ulceration, and necrosis)
- **Alkalosis:** irritability, confusion, twitching, hyperreflexia, stimulation, slow respirations, cyanosis, irregular pulse
- **Milk-alkali syndrome**: confusion, headache, nausea, vomiting, anorexia, urinary stones, hypercalcemia
- **Pregnancy/breastfeeding:** Use as an antacid is considered unsafe, may breastfeed

### Patient/family education

- Instruct patient to chew antacid tab and drink 8 oz of water; not to take antacid with milk because milk-alkali syndrome may result; not to use antacid for more than 2 wk
- Advise patient to notify prescriber if indigestion is accompanied by chest pain; trouble breathing; diarrhea; dark, tarry stools; vomit that looks like coffee grounds; swelling of feet/ankles
- Teach patient about sodium-restricted diet; to avoid use of baking soda for indigestion

### Evaluation

**Positive therapeutic outcome**
- ABGs, electrolytes, blood pH, $HCO_3$ normal levels
- Decreased gastric pain

## sodium biphosphate/ sodium phosphate (OTC)

**Fleet Enema, Phospho-soda**

*Func. class.:* Laxative, saline

**ACTION:** Increases water absorption in the small intestine by osmotic action; laxative effect occurs by increased peristalsis and water retention

**Therapeutic outcome:** Absence of constipation

**USES:** Constipation, bowel or rectal preparation for surgery, examination

## CONTRAINDICATIONS

Hypersensitivity, rectal fissures, abdominal pain, nausea/vomiting, appendicitis, acute surgical abdomen, ulcerated hemorrhoids, Na-restricted diets, renal failure, hyperphosphatemia, hypocalcemia, hypokalemia, hypernatremia, Addison's disease, HF, ascites, bowel perforation, megacolon, imperforate anus

**BLACK BOX WARNING:** GI obstruction, renal failure

**Precautions:** Pregnancy

**BLACK BOX WARNING:** Colitis, elderly, hypovolemia, renal disease

## DOSAGE AND ROUTES

**Adult:** PO 20-30 ml (Phospho-soda)
**Child:** PO 5-15 ml (Phospho-soda)
**Adult and child >12 yr:** RECT enema (118 ml)
**Child 2-12 yr:** RECT ½ enema (59 ml)

**Available forms:** Enema 7 g/phosphate and 19 g/biphosphate/118 ml; oral sol 18 g phosphate/48 g biphosphate/100 ml

### Implementation

**PO route**
- Give on empty stomach
- Mix oral sol in cold water
- Take alone for better absorption; do not take within 1 hr of other products

## ADVERSE EFFECTS

**CV:** Dysrhythmias, cardiac arrest, hypotension, widening QRS complex
**GI:** *Nausea, cramps,* diarrhea
**META:** Electrolyte, fluid imbalances

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Up to 20% (rec) |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys |
| **Half-life** | Unknown |

### Pharmacodynamics

| | PO | Rect |
|---|---|---|
| **Onset** | ½-3 hr | 5 min |
| **Peak** | Unknown | Unknown |
| **Duration** | Unknown | Unknown |

## NURSING CONSIDERATIONS

### Assessment
- Assess stools: color, amount, consistency
- Assess for bowel pattern, bowel sounds (frequency, intensity), flatulence, distention, increased temp, dietary patterns (fluid, bulk), exercise
- Assess for cramping, rectal bleeding, nausea, vomiting; if these symptoms occur, product should be discontinued

### Patient/family education
- Advise patient not to use laxatives or enema for long-term therapy; bowel tone will be lost
- Teach patient that normal bowel movements do not always occur daily
- Caution patient not to use in presence of abdominal pain, nausea, vomiting
- Caution patient to notify prescriber if constipation is unrelieved or if symptoms of electrolyte imbalance occur: muscle cramps, pain, weakness, dizziness, excessive thirst
- Instruct patient to maintain adequate fluid consumption to help prevent constipation

### Evaluation

**Positive therapeutic outcome**
- Decrease in constipation

## sodium polystyrene sulfonate (Rx)

(po-lee-stye'reen)

**Kalexate, Kayexalate, K-Exit, Kionex, SPS**

*Func. class.:* Potassium-removing resin
*Chem. class.:* Cation exchange resin

**ACTION:** Removes potassium by exchanging sodium for potassium in body; occurs primarily in large intestine

**Therapeutic outcome:** Potassium levels within accepted range

**USES:** Hyperkalemia in conjunction with other measures

## CONTRAINDICATIONS

Hypersensitivity to saccharin or parabens that may be in some products; GI obstruction, neonate (reduced gut motility)

**Precautions:** Pregnancy, geriatric, renal failure, HF, severe edema, severe hypertension, sodium restriction, constipation, GI bleeding, hypocalcemia

## DOSAGE AND ROUTES

**Adult:** PO 15 g daily-qid; RECT enema 30-50 q1-2hr initially prn, then q6hr prn
**Child (unlabeled):** PO 1 g/kg q6hr prn; RECT 1 g/kg q2-6hr prn

**Available forms:** Powder for susp 453.6 g, 454 g; oral susp 15 g/60 ml

### Implementation

**PO route**

• Powdered resin: Usually given orally as a suspension in water or in a syrup. Usually, the amount of fluid ranges 20-100 ml, depending on the dose, or 3-4 ml per g of resin. Suspensions should be freshly prepared and not stored for longer than 24 hr. The suspension may also be introduced into the stomach via a tube or the powdered resin may be mixed with the patient's food; the powder should not be mixed with foods or liquids that contain a large amount of potassium (bananas or orange juice)

**Rectal route**

• Precede retention enema with a cleansing enema; instruct patient to lie down on left side with lower leg extended and the upper leg flexed for support or place the patient in the knee-chest position. Gently insert a soft, large (French 28) rubber tube into the rectum for a distance of about 20 cm; the tip should be well into the sigmoid colon. Tape the tube in place. Suspend the sodium polystyrene sulfonate powdered resin in 100 ml of an aqueous vehicle (water or sorbitol) which has been warmed to body temperature and introduce through the tube by gravity. The particles should be kept suspended by stirring the suspension during administration. Alternatively, 120-180 ml of a commercially available suspension may be administered as a retention enema after the suspension has been warmed to body temperature. Following administration, flush the tube with 50-100 ml of fluid and clamp the tube and leave in place. The suspension should be retained in the colon for at least 30-60 min or for several hours, if possible

• After several hours have passed, administer a cleansing enema using a nonsodium containing solution at body temperature. Up to 2 quarts of fluid may be necessary. Drain fluid through a Y-tube connection. Observe the drainage if sorbitol was used

## ADVERSE EFFECTS

**GI:** *Constipation,* anorexia, nausea, vomiting, diarrhea (sorbitol), *fecal impaction,* gastric irritation
**META:** Hypocalcemia, hypokalemia, hypomagnesemia, sodium retention

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | None |
| **Distribution** | None |
| **Metabolism** | None |
| **Excretion** | Feces |
| **Half-life** | Unknown |

### Pharmacodynamics

| | PO | Rect |
|---|---|---|
| **Onset** | 2-12 hr | 2-12 hr |
| **Peak** | Unknown | Unknown |
| **Duration** | 6-24 hr | 4-6 hr |

## INTERACTIONS

### Individual drugs

Sorbitol: increased colonic necrosis, do not use concurrently
Lithium: decreased effect of lithium

### Drug classifications

Diuretics (loop), cardiac glycosides: increased hypokalemia
Magnesium/calcium antacids: increased metabolic acidosis
Thyroid hormones: decreased effect of thyroid hormones

## NURSING CONSIDERATIONS

### Assessment

• Assess bowel function daily: amount of stool, color, characteristics
• Assess for hypotension: confusion, irritability, muscular pain, weakness
• Hyperkalemia: assess for confusion, dyspnea, weakness, dysrhythmias
• Monitor electrolytes: potassium, sodium, calcium, magnesium; I&O ratio, weight daily
• Monitor ECG for spiked T-waves, depressed ST segments, prolonged QT interval, and widening QRS complex
• Monitor I&O ratio, weight daily, crackles, dyspnea, jugular vein distention, edema

• Monitor for digoxin toxicity (nausea, vomiting, blurred vision, anorexia, dysrhythmia) in those receiving digoxin

### Patient/family education

• Explain reason for medication and expected results
• Teach patient to avoid laxatives, antacids, electrolyte-based products unless approved by prescriber
• Teach patient to use a low-potassium diet, provide sample diet

### Evaluation

**Positive therapeutic outcome**
• Potassium level 3.5-5 mg/dl

## sofosbuvir

(soe-fos′bue-vir)
**Sovaldi**
*Func. class.:* Antiviral, antihepatitis agent
*Chem. class.:* Adenosine monophosphate analog

**ACTION:** Inhibits hepatitis C virus RNA polymerase by incorporating the polymerase into the viral RNA, also acts as a chain terminator

**Therapeutic outcome:** Decreased symptoms of chronic hepatitis C

**USES:** Chronic hepatitis C (genotypes 1, 2, 3, 4) with compensated liver disease

## CONTRAINDICATIONS

Hypersensitivity, pregnancy in combination; male-mediated teratogenicity

**Precautions:** Pregnancy breastfeeding, children, hepatic/renal disease

**BLACK BOX WARNING:** Hepatitis B exacerbation

## DOSAGE AND ROUTES

### Genotype 1, 4

**Adult: PO** 400 mg/day with peginterferon alfa and ribavirin × 12 wk; may consider use for genotype 1 with ribavirin × 24 wk

### Genotype 2

**Adult: PO** 400 mg/day with ribavirin × 12 wk

### Genotype 3

**Adult: PO** 400 mg/day with ribavirin or daclatasvir × 24 wk

### Available forms: Tabs 400 mg

### Implementation

• Give by mouth without regard to food
• Do not use as monotherapy

## ADVERSE EFFECTS

**CNS:** Headache, chills, weakness, fatigue, fever, insomnia
**GI:** Diarrhea, hyperbilirubinemia
**MISC:** Rash, pruritus, neutropenia, anemia, myalgia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 61%-65% protein |
| **Metabolism** | Unknown |
| **Excretion** | By kidneys 80% |
| **Half-life** | 0.4-27 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | ½-2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

OXcarbazepine, rifabutin, rifapentine, tipranavir: decreased sofosbuvir effect, avoid concurrent use

### Drug classifications

P-glycoprotein (P-gp) inducers (carBAMazepine, PHENobarbital, phenytoin, rifampin): decreased sofosbuvir effect, avoid concurrent use

## NURSING CONSIDERATIONS

### Assessment

• Severe renal disease/eGFR <30 ml/min/1.73 $m^2$: monitor BUN, creatinine
• Monitor geriatric patients more carefully; may develop renal, cardiac symptoms more rapidly
• **Pregnancy:** if planned or suspected; if pregnant call the Pregnancy Registry 800-258-4263, obtain pregnancy test before starting treatment

**BLACK BOX WARNING:** Hepatitis B exacerbation: Monitor HBsAg, HBV DNA, hepatic enzymes, bilirubin

• **HBV reactivation:** Test is required before starting product, monitor throughout, monitor coinfected patients closely

### Patient/family education

• Teach patient that optimal duration of treatment is unknown, that product is not a cure, that transmission may still occur
• Instruct patient to avoid use with other medications unless approved by prescriber
• Instruct patient not to stop abruptly unless directed, worsening of hepatitis may occur
• **Pregnancy:** Teach patient to notify prescriber if pregnancy is planned or suspected,

S

use 2 forms of reliable contraception, avoid breastfeeding

**BLACK BOX WARNING:** Hepatitis B exacerbation: Notify prescriber immediately of liver toxicity: yellow eyes, skin, fatigue, weakness, loss of appetite, nausea/vomiting, light-colored stools

### Evaluation

**Positive therapeutic outcome**

- Therapeutic response: decreased symptoms of chronic hepatitis C

## sofosbuvir/velpatasvir

(soe-fosbue-vir/vel-patas-vir)

**Epclusa**

*Func. class.:* Antiviral, antihepatitis agent

**ACTION:** **Sofosbuvir:** A nucleotide prodrug that prevents hepatitis C viral (HCV) replication by inhibiting the activity of HCV NS5B RNA polymerase. It undergoes intracellular metabolism to form an active uridine analog triphosphate. Hepatitis C virus NS5B RNA polymerase incorporates this metabolite into the viral RNA, where it acts as a chain terminator. It does not inhibit human DNA or RNA polymerase, nor does it block mitochondrial RNA polymerase
**Velpatasvir:** Inhibits the HCV NS5A protein, which is required for viral replication

**Therapeutic outcome:** Decreased symptoms of chronic hepatitis C

**USES:** Treatment of chronic hepatitis C infection, including genotypes 1, 2, 3, 4, 5, and 6 in those without cirrhosis and in patients with compensated cirrhosis (Child-Pugh A); treatment of chronic hepatitis C infection in patients with decompensated cirrhosis (Child-Pugh B or C)

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Breastfeeding, hepatitis C and HIV coinfection, male-mediated teratogenicity, pregnancy, renal failure/impairment

**BLACK BOX WARNING:** Hepatitis B exacerbation

## DOSAGE AND ROUTES

**Treatment of chronic hepatitis C infection in patients without cirrhosis and in patients with compensated cirrhosis (Child-Pugh A)**

**Adult: PO** 1 tablet (400 mg sofosbuvir; 100 mg velpatasvir) qday × 12 wk

**Treatment of chronic hepatitis C infection in patients with decompensated cirrhosis (Child-Pugh B or C)**

**Adult: PO** 1 tablet (400 mg sofosbuvir; 100 mg velpatasvir) qday plus ribavirin × 12 wk. The dose of ribavirin is based on weight as follows: <75 kg give 500 mg bid; ≥75 kg 600 mg bid

**Available forms:** Tablet 400-100 mg

### Implementation:

- Take without regard to food
- If given with ribavirin, take ribavirin with food

## ADVERSE EFFECTS

**CNS:** *Fatigue, headache, insomnia,* depression, irritability, asthenia
**GI:** *Nausea, diarrhea*
**Hema:** Anemia
**Integ:** Rash
**Meta:** Hyperbilirubinemia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Sofosbuvir: 61%-65% protein binding; velpatasvir 99.5% protein binding |
| **Metabolism** | Sofosbuvir: Converted in the liver from the nucleotide prodrug to active nucleoside analog triphosphate<br>Velpatasvir: Metabolized by CYP2B6, CYP2C8, and CYP3A4 |
| **Excretion** | Sofosbuvir: Elimination via kidneys 80%, feces 14%, expired air 2.5%<br>Velpatasvir: Excretion in bile 77% of the parent drug, 95% feces, 0.4% urine |
| **Half-life** | Sofosbuvir: Half-life of 25 hr<br>Velpatasvir: Terminal elimination half-life 15 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Sofosbuvir: Peak 0.5-1 hr Velpatasvir: Peak 3 hr, increased by high-fat meal |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

CYP3A4 inducers (armodafinil, barbiturates, bexarotene, bosentan, carbamazepine, dexamethasone, efavirenz, enzalutamide, eslicarbazepine, ethanol, etravirine, felbamate, flutamide, griseofulvin, lesinurad, modafinil,

nafcillin, nevirapine, primidone, phenytoin, phenobarbital, pioglitazone, rifampin, rifapentine, rifabutin); antacids, PPIs: separate by 4 hr: decreased velpatasvir level
CYP3A4 inhibitors (aldesleukin, aliskiren, amlodipine, amprenavir, aprepitant, atazanavir, boceprevir, bromocriptine, chloramphenicol, ciprofloxacin, clarithromycin, cyclosporine, dalfopristin/quinupristin, danazol, darunavir, dasatinib, delavirdine, diltiazem, dronedarone, erythromycin, fluconazole, fluoxetine, fluvoxamine, fosaprepitant, idelalisib, imatinib, indinavir, isavuconazonium, isoniazid, itraconazole, ketoconazole, miconazole, ritonavir, tipranavir), P-gp inhibitors: increased velpatasvir level
P-glycoprotein (P-gp) inducers avoid concurrent use: decreased sofosbuvir level

### Individual drugs

Amiodarone, avoid using together: increased bradycardia
Atorvastatin: increased myopathy, rhabdomyolysis
Azithromycin, boceprevir, canagliflozin, carvedilol, clarithromycin, crizotinib: increased effect of both products
Carvedilol, cobicistat: increased sofosbuvir level
Ritonavir: decreased levels of ritonavir

### Drug/herb

St. John's wort, do not use together: decreased sofosbuvir level

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Hepatitis B exacerbation:** Monitor serum HCV-RNC baseline and periodically, continue to monitor coinfected patients during and after treatment for clinical and laboratory signs of hepatitis B exacerbation (HBsAg, HBV DNA, hepatic enzymes, bilirubin), assess for signs of liver toxicity (yellow eyes or skin, fatigue, weakness, loss of appetite, nausea, vomiting, or light-colored stools); to decrease the risk of reactivating an HBV infection, screen all potential recipients for evidence of current or prior HBV infection by testing HBsAg and anti-HBc concentrations. For those patients whose screening reveals serologic evidence of HBV infection, a baseline HBV DNA concentration should be obtained before starting this product; monitor LFTs

- Severe renal disease/GFR <30 ml/min/1.73 $m^2$, monitor BUN, creatinine
- Geriatric patients more carefully, may develop renal, cardiac symptoms more rapidly
- **Pregnancy:** The use of sofosbuvir/velpatasvir in combination with ribavirin is contraindicated in pregnant women and in the male partners of women who are pregnant, birth defects and/or death of the fetus may occur. Ribavirin therapy also may cause male-mediated teratogenicity and is contraindicated for use during pregnancy, in females who may become pregnant, or in men whose female partners are pregnant. Patients and their partners are required to use 2 reliable forms of effective contraception during treatment and for 6 months after use of these combination therapies. Patients who are not willing to practice strict contraception should not receive sofosbuvir/velpatasvir with ribavirin. Females must also undergo a pregnancy test immediately before initiation of therapy, monthly during therapy, and for 6 months post-therapy. To monitor maternal-fetal outcomes of pregnancies in female patients and female partners of male patients exposed to ribavirin during treatment and for 6 months following cessation of treatment, health care providers are encouraged to report any cases to the Ribavirin Pregnancy Registry; telephone (800) 593-2214. For patients who are also infected with HIV and taking concomitant antiretrovirals, an Antiretroviral Pregnancy Registry is available at (800) 258-4263, not to breastfeed
- **Anemia:** Monitor Hgb/Hct if anemia is suspected

### Patient/family education

- That optimal duration of treatment is unknown; that product is not a cure, that transmission to others may still occur
- To avoid use with other products unless approved by prescriber
- Not to stop abruptly unless directed, worsening of hepatitis may occur, keep in original container

**BLACK BOX WARNING: Hepatitis exacerbation:** report to provider immediately signs of liver toxicity (yellow eyes or skin, fatigue, weakness, loss of appetite, nausea, vomiting, or light-colored stools)

- **Pregnancy:** Teach patients that they and their partners are required to use 2 reliable forms of effective contraception during treatment and for 6 months after use of these combination therapies, pregnancy tests are needed immediately before initiation of therapy, monthly during therapy, and for 6 months post-therapy, not to breastfeed

### Evaluation

- Decreased symptoms of chronic hepatitis C

## solifenacin (Rx)

(sol-i-fen′a-sin)

**VESIcare**

*Func. class.:* Urinary antispasmodic, anticholinergic

*Chem. class.:* Antimuscarinic receptor antagonist

**Do not confuse:** Vesicare/Vesanoid

**ACTION:** Relaxes smooth muscles in urinary tract by inhibiting acetylcholine at postganglionic sites

**Therapeutic outcome:** Decreased dysuria, frequency, nocturia, incontinence

**USES:** Overactive bladder (urinary frequency, urgency, incontinence)

## CONTRAINDICATIONS

Hypersensitivity, uncontrolled closed-angle glaucoma, urinary retention, gastric retention

**Precautions:** Pregnancy, breastfeeding, children, geriatric patients, renal/hepatic disease, controlled closed-angle glaucoma, bladder outflow obstruction, GI obstruction, decreased GI motility, history of QT prolongation

## DOSAGE AND ROUTES

**Adult:** PO 5 mg/day, max 10 mg/day

### Renal/hepatic dose

**Adult:** PO CCr <30 ml/min 5 mg/day; Child-Pugh B max 5 mg/day

**Available forms:** Tabs 5, 10 mg

### Implementation

**PO route**

- Without regard to meals
- Swallow product whole with water, liquid

## ADVERSE EFFECTS

**CNS:** Anxiety, paresthesia, fatigue, *dizziness,* headache, confusion, delirium, depression, drowsiness, fatigue

**CV:** Chest pain, hypertension, QTc prolongation, peripheral edema, palpitations, sinus tachycardia

**EENT:** *Vision abnormalities, xerophthalmia,* nasal dryness

**GI:** *Nausea, vomiting, anorexia,* abdominal pain, *constipation,* dry mouth, dyspepsia

**GU:** Dysuria, urinary retention, frequency, UTI

**INTEG:** Rash, pruritus, angioedema, exfoliative dermatitis, erythema multiforme

**MISC:** Hyperthermia

**RESP:** Bronchitis, cough, pharyngitis, URI

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid (90%) |
| **Distribution** | 98% protein bound |
| **Metabolism** | Extensively metabolized by CYP3A4 |
| **Excretion** | Excreted in urine (69%)/ feces (22%) |
| **Half-life** | Terminal half-life 45-68 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Drug classifications

Azoles, macrolides, fluoroquinolones, class IA, III antidysrhythmics: increased QT prolongation

Benzodiazepines, hypnotics, opioids, sedatives: increased CNS depression

CYP3A4 inducers (carBAMazepine, nevirapine, phenobarbital, phenytoin): decreased effects of solifenacin

CYP3A4 inhibitors (clarithromycin, diclofenac, doxycycline, erythromycin, isoniazid, ketoconazole, nefazodone, propofol, protease inhibitors, verapamil): increased action of solifenacin, max dose 5 mg

### Drug/herb

St. John's wort: decreased effects

### Drug/food

Grapefruit juice: increased effect

### Drug/lab test

Increased: LFTs

## NURSING CONSIDERATIONS

### Assessment

- **Urinary patterns:** assess for distention, nocturia, frequency, urgency, incontinence
- **Allergic reactions:** assess for rash; if this occurs, product should be discontinued
- **Cardiac patients:** monitor ECG for QT prolongation, avoid products that can increase QT prolongation
- **Angioedema:** assess for swelling of face, lips, tongue, larynx
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed, excretion unknown

### Patient/family education

- Caution patient to avoid hazardous activities; dizziness may occur
- Advise patient that constipation, blurred vision may occur, to notify prescriber if abdominal pain with constipation occurs
- Instruct patient to call prescriber if severe abdominal pain or constipation lasts for 3 or more days

- Advise patient that heat prostration may occur if used in a hot environment, sweating is decreased
- Teach patient to take without regard to food
- Teach patient to swallow tab whole, do not crush, chew

### Evaluation

**Positive therapeutic outcome**
- Urinary status: decreased dysuria, frequency, nocturia, incontinence

**⚠ HIGH ALERT**

## somatropin (Rx)

(soe-ma-troe′pin)

**Genotropin, Humatrope, Norditropin, Norditropin Flexpro, Nutropin, Nutropin AQ, Omnitrope, Saizen, Serostim, Zomacton, Zorbtive**

*Func. class.:* Pituitary hormone
*Chem. class.:* Growth hormone

**Do not confuse:** somatropin/somatrem/SUMAtriptan

**ACTION:** Stimulates growth; similar to natural growth hormone—both preparations are developed by recombinant DNA technique

**Therapeutic outcome:** Increase in height as a result of skeletal growth in pituitary growth hormone deficiency

**USES:** Pituitary growth hormone deficiency (hypopituitary dwarfism), children with human growth hormone deficiency, AIDS wasting syndrome, cachexia, adults with somatropin deficiency syndrome (SDS), short stature in Noonan syndrome, SHOX deficiencies; Turner's syndrome, Prader-Willi syndrome

## CONTRAINDICATIONS

Hypersensitivity to benzyl alcohol, creosol, glycerin hypersensitivity (for medications that contain these products), closed epiphyses, acute respiratory failure, Prader-Willi syndrome with obesity, trauma

**Precautions:** Pregnancy, breastfeeding, newborns, geriatric, diabetes mellitus, hypothyroidism, intracranial lesions, prolonged treatment in adults, scoliosis, sleep apnea, chemotherapy, respiratory disease

## DOSAGE AND ROUTES

### >> Genotropin

**Child:** SUBCUT 0.16-0.24 mg/kg/wk, divided into 6 or 7 daily inj, give in abdomen, thigh, buttocks

**Adult:** SUBCUT 0.4-0.8 mg/kg/wk divided in 6-7 daily doses

### >> Humatrope

**Child:** SUBCUT/IM 0.006 mg/kg divided into equal doses either on 3 alternate days or 6 ×/wk, max 0.3 mg/kg/wk
**Adult:** IM 0.018 units/kg/day, max 0.0125 units/kg/day

### Growth hormone deficiency

### >> Nutropin/Nutropin AQ

**Child:** SUBCUT 0.3 mg/kg/wk

### >> Serostim

**Adult:** SUBCUT at bedtime >55 kg 6 mg, 45-55 kg 5 mg, 35-45 kg 4 mg

### >> Norditropin

**Child:** SUBCUT 0.024-0.034 mg/kg 6-7 ×/wk

### Replacement of GH in GH deficiency

**Adult:** SUBCUT (Saizen) 0.005 mg/kg/day; may increase after 4 wk to max 0.01 mg/kg/day

**Available forms:** Powder for inj (lyophilized) 1.5 mg (4 international units/ml), 4 mg (12 international units/vial), 5 mg (13 international units/vial), 5 mg (15 international units/vial), rDNA origin, 5.8 mg (15 international units/ml), 6 mg (18 international units/ml), 8 mg (24 international units/vial), 10 mg (26 international units/vial), inj 10 mg (30 international units/vial); 5, 10, 15 mg/1.5 ml

### Implementation

- Store in refrigerator for <1 mo; if reconstituted, <1 wk; do not use discolored or cloudy sol
- Give IM or subcut, do not use IV
- Discontinue therapy if final height is achieved or epiphyseal fusion occurs
- Visually inspect parenteral products for particulate matter and discoloration

### >> Genotropin

- Powder, filled in a two-chamber cartridge with the active substance in the front chamber and the diluent in the rear chamber. Available in a 5 mg cartridge (green tip) and a 12 mg cartridge (purple tip). The 5 and 12 mg cartridges can be used with the Genotropin Pen or the Genotropin Mixer. Also, in various doses ranging from 0.2 mg to 2 mg, in single use, auto-mix devices called Genotropin Miniquicks
- *Cartridges:* Store cartridges refrigerated prior to reconstitution, do not freeze; protect from light. A reconstitution device is supplied and is used to mix the powder and the diluent. After the powder and diluent are mixed, gently tip the cartridge upside down a few times until

dissolved. DO NOT SHAKE. If the solution is cloudy, do not use. Following reconstitution, the 5 mg cartridge will contain a 5 mg/ml and the 12 mg cartridge will contain 12 mg/ml solution; both the 5 mg and 12 mg cartridges contain overfill. The cartridges contain diluent with preservative (m-cresol) and may be stored refrigerated ≤28 days after reconstitution. Do not use the 5 mg and 12 mg cartridges in patients with m-cresol hypersensitivity

• *Genotropin Miniquicks:* After dispensing, but prior to reconstitution, store at or 77 degrees ≤3 mo. A reconstitution device is supplied and is used to mix the powder and diluent. Ten different strengths are available that each deliver a fixed volume of 0.25 ml. This product contains a diluent with no preservative, refrigerate after reconstitution and use within 24 hr. Use the reconstituted solution only once and discard any remaining

## >> Humatrope

• Prior to reconstitution, store refrigerated

• *Vials:* Reconstitute each 5-mg vial with 1.5-5 ml of the diluent (contains m-cresol as a preservative) or Bacteriostatic Water for Injection (contains benzoyl alcohol as a preservative); sterile water for injection can be used with a hypersensitivity to both m-cresol and benzoyl alcohol. Direct the liquid against the glass vial wall. Swirl until contents are dissolved. Do not shake. If the solution is cloudy, do not use. Small, colorless particles may be present after refrigeration; this is not unusual for solutions containing proteins. Vials reconstituted with the diluent or bacteriostatic water are stable for 14 days when refrigerated; for vials reconstituted with sterile water, use the vial only once and discard; if not used immediately, refrigerate and use within 24 hr; avoid freezing

• *Cartridges:* Reconstitute cartridges using ONLY the supplied diluent syringe; the cartridges are designed for use only with the Humatrope injection device. Once reconstituted, the cartridges are stable for up to 28 days when stored refrigerated. Store the injection device without the needle attached; avoid freezing reconstituted solutions

## >> Norditropin

• Do not use reconstituted solution if cloudy or contains particulate matter

• Prior to use, store refrigerated

• Reconstitution of the cartridges is not required. The cartridge is intended for use only with the NordiPen injector; a prefilled, disposable pen, NordiFlex Pen injector, is also available. Each cartridge size (5 mg, 10 mg, or 15 mg per 1.5 ml cartridge) has a color-coded corresponding pen, which is graduated to deliver an appropriate dose based on the solution concentration; NordiPen and NordiFlex Pen allow for administration of a minimum 0.25-mg dose to a maximum 4.5-mg dose, depending on cartridge concentrations. Follow directions provided in Pen injector instruction booklet

• After a cartridge has been inserted into the NordiPen injector or once a NordiFlex pen is in use, the pen should be stored refrigerated and used within 4 wk. Alternatively, the 5-mg and 10-mg cartridges may be stored in the pen at room temperatures, no higher than 77° F, for up to 3 wk. NovoFine needles are recommended for administration. Wipe the stopper of the pen cartridge with rubbing alcohol

## >> Nutropin

• Prior to reconstitution, store refrigerated

• Reconstitute each 5-mg vial with 1-5 ml bacteriostatic water for injection (benzyl alcohol preserved) and each 10-mg vial with 1-10 ml of bacteriostatic water for injection (benzyl alcohol preserved). If using for newborns, reconstitute with sterile water for injection. Direct the liquid against the glass vial wall. Swirl vial with a gentle rotary motion until contents are dissolved completely. Do not shake. If the solution is cloudy after reconstitution or refrigeration, do not use. Small, colorless particles may be present after refrigeration; this is not unusual for solutions containing proteins

• Solutions reconstituted with bacteriostatic water for injection are stable for 14 days refrigerated

• Solutions reconstituted with sterile water for injection should be used immediately and only once; discard any unused portions. Avoid freezing reconstituted solutions

## >> Nutropin AQ

• Does not require reconstitution. Solution should be clear. Small, colorless particles may be present after refrigeration; this is not unusual for solutions containing proteins. Allow vial or pen cartridge to come to room temperature and gently swirl. If solution is cloudy, do not use

• *Vials:* Before needle insertion, wipe the vial septum with rubbing alcohol or antiseptic solution to prevent contamination by microorganisms that may be introduced by repeated needle insertions. Administer using sterile, disposable syringes and needles. Use syringes with small enough volume that the prescribed dose can be drawn from the vial with reasonable accuracy

• *Pen cartridge:* Two strengths are available: 10 mg and 20 mg; intended for use only with Nutropin AQ Pen. Each pen and cartridge are color coded to ensure accurate placement

of the 10-mg or 20-mg cartridge into the appropriate pen. Do not use the 20-mg cartridge in the pen intended for the 10-mg cartridge, and vice versa. Wipe septum of pen cartridge with rubbing alcohol or antiseptic solution to prevent contamination by microorganisms that may be introduced by repeated needle insertions. Administer using sterile, disposable needles. Follow the directions provided in the Nutropin AQ Pen Instructions for Use. The Nutropin AQ 10 pen allows for administration of a minimum 0.1-mg dose to a maximum 4-mg dose, in 0.1-mg increments. The Nutropin AQ 20 pen allows for administration of a minimum 0.2-mg dose to a maximum 8-mg dose, in 0.2-mg increments

• *Prefilled device:* A prefilled multi-dose, dial-a-dose device is available in 3 strengths. Administer using disposable needles. Follow the directions provided in the Nutropin AQ NuSpin Instructions for Use. The Nutropin AQ Nuspin 5 allows for administration of a minimum dose of 0.05 mg to a maximum dose of 1.75 mg, in increments of 0.05 mg. The Nutropin AQ Nuspin 10 allows for administration of a minimum dose of 0.1 mg to a maximum dose of 3.5 mg, in increments of 0.1 mg. The Nutropin AQ Nuspin 20 allows for administration of a minimum dose of 0.2 mg to a maximum dose of 7 mg, in increments of 0.2 mg

• After initial use, vials, cartridges, and prefilled devices are stable for 28 days refrigerated; avoid freezing. Vials, cartridges, and prefilled devices are light sensitive; protect from light

### >> Omnitrope

• Prior to reconstitution, store vials refrigerated. Store in the carton; Omnitrope is sensitive to light

• *Vials:* Reconstitute the vial with diluent provided using a sterile, disposable syringe. Swirl the vial gently, but do not shake. If the solution is cloudy after reconstitution, the contents must not be injected. After reconstitution, the 1.5-mg vial may be refrigerated ≤24 hr. The 1.5-mg vial does not contain a preservative and should only be used once; discard any remaining solution. The 5.8-mg vial diluent contains benzoyl alcohol as a preservative. After reconstitution, the contents must be used within 3 wk. After the first injection, store the 5.8-mg vial in the carton, to protect from light, in the refrigerator; avoid freezing

• *Omnitrope Pen 5 cartridge:* Each 5-mg cartridge must be inserted into the Omnitrope Pen 5 delivery system. Follow the directions provided in the Omnitrope Instructions for Use. The cartridge contains benzyl alcohol as a preservative. Once initially used, store refrigerated ≤28 days, protect from light, avoid freezing

• *Omnitrope Pen 10 cartridge:* Each 10-mg cartridge must be inserted into the Omnitrope Pen 10 delivery system. Follow the directions provided in the Omnitrope Instructions for Use. Once initially used, store refrigerated ≤28 days, protect from light, avoid freezing

### >> Saizen

• Prior to reconstitution, store at room temperature

• *Vials:* Reconstitute each 5 mg vial with 1-3 ml bacteriostatic water for injection; reconstitute each 8.8-mg vial with 2-3 ml bacteriostatic water for injection (benzyl alcohol preserved). In patients with hypersensitivity to benzyl alcohol, the vials can be mixed with sterile water for injection. Direct the liquid against the glass vial wall. Swirl vial with a gentle rotary motion until contents are dissolved completely. Do not shake. The solution should be clear; if it is cloudy immediately after reconstitution or refrigeration, do not use. Small, colorless particles may be present after refrigeration; this is not unusual for solutions containing proteins. After reconstitution, store vials mixed with bacteriostatic water for injection refrigerated and use within 14 days. For vials mixed with sterile water for injection, the solution should be used immediately, and any unused portion should be discarded. Avoid freezing

• *Cartridges:* Available in 4-mg and 8.8-mg click.easy cartridges for use in a compatible injection device. A reconstitution device supplied by the manufacturer is used to mix the Saizen with accompanying diluent containing metacresol. Cartridges reconstituted with the diluent containing metacresol are stable under refrigeration for up to 21 days. Avoid freezing

### >> Serostim

• Prior to reconstitution, store vials and diluent at room temperature (15-30° C / 59-86° F).

• *Vials:* Reconstitute the 5-mg or 6-mg vials with 0.5-1 ml of supplied diluent (sterile water for injection). Reconstitute the 4-mg vial with 0.5-1 ml of bacteriostatic water for injection (benzyl alcohol preserved) and the 8.8-mg vial with 1-2 ml of bacteriostatic water for injection (benzyl alcohol preserved). Direct the liquid against the glass vial wall. Swirl vial with a gentle rotary motion until contents are dissolved completely. Do not shake. The solution should be clear; if it is cloudy immediately after reconstitution or refrigeration, do not use. Small, colorless particles may be present after refrigeration; this is not unusual for solutions containing proteins. If reconstituted with sterile water for injection, use within 24 hr. If reconstituted with bacteriostatic water for injection (benzyl alcohol preserved), the solution is stable for up to

14 days under refrigeration (2-8° C or 36-46° F). Avoid freezing
• *Cartridges:* Available in 8.8-mg click.easy cartridges for use in a compatible injection device. A reconstitution device is supplied by the manufacturer and is used to mix the Serostim with accompanying diluent containing metacresol. After reconstitution, cartridges are stable under refrigeration for up to 21 days. Avoid freezing

### >> Serostim LQ
• Prior to use, store refrigerated
• Available in 6-mg single-use cartridges that do not require reconstitution. Administer using sterile, disposable syringes and needles
• Bring to room temperature prior to use. Discard single-use cartridge after use, even if some drug remains. Discard cartridges after the expiration date stated on the product. Do not freeze. Protect from light

### >> Zomacton
(formerly Tev-Tropin)
• Prior to reconstitution, store refrigerated
• Reconstitute each 5-mg vial with 1-5 ml bacteriostatic 0.9% sodium chloride (benzyl alcohol preserved) for injection. Direct the liquid against the glass vial wall. Swirl vial with a gentle rotary motion until contents are dissolved completely. Do not shake. The solution should be clear; if it is cloudy immediately after reconstitution, do not inject. Small, colorless particles may be present after refrigeration; this is not unusual for solutions containing proteins. When administering to newborns, reconstitute with sterile normal saline for injection that is unpreserved
• Solution reconstituted with bacteriostatic 0.9% sodium chloride is stable for 14 days when stored refrigerated. Solution reconstituted with sterile normal saline should be used only once, with any remaining solution discarded. Avoid freezing

### >> Valtropin
• Prior to dispensing, store vials and diluent refrigerated. After dispensing to patients, may be stored at or below 77° F for up to 3 months
• Reconstitute each 5-mg vial with the entire contents of the accompanying diluent, which contains metacresol as a preservative. If patients are allergic to metacresol, sterile water for injection can be used. Direct the liquid against the glass vial wall. Swirl vial with a gentle rotary motion until contents are dissolved completely. Do not shake. The solution should be clear; if it is cloudy or contains particulate matter immediately after reconstitution or after refrigeration, do not inject. The final concentration of the reconstituted solution is 3.33 mg/ml
• After reconstituted with the provided diluent, solutions can be stored refrigerated for up to 14 days. After reconstituted with sterile water for injection, use only one dose of Valtropin per vial and discard the unused portion if not used immediately

### >> Zorbtive
• Unreconstituted vials of drug and diluent may be stored at room temperature until expiration date
• Reconstitute each vial of 4 mg, 5 mg, or 6 mg with 0.5-1 ml sterile water for injection, USP. Reconstitute each 8.8 mg with 1-2 ml bacteriostatic water for injection (0.9% benzyl alcohol preserved); in newborns or patients with a benzyl alcohol hypersensitivity, sterile water for injection can be used. Review manufacturer's labeling for expected concentrations. Direct the liquid against the glass vial wall. Swirl vial with a gentle rotary motion until contents are dissolved completely. Do not shake. The solution should be clear; if it is cloudy after reconstitution or refrigeration, do not use. Small, colorless particles may be present after refrigeration; this is not unusual for solutions containing proteins
• After reconstitution with sterile water for injection, use the solution immediately and discard any unused portion. When using bacteriostatic water for injection, reconstituted solutions are stable for up to 14 days refrigerated. Avoid freezing vials of drug or diluent, or reconstituted vials

**IM route**
• Inject deeply into a large muscle; aspirate prior to injection; rotate injection sites daily

**Subcut route**
• Volumes >1 ml of reconstituted solution is not recommended; do not inject intradermally
• Allow refrigerated solutions to come to room temperature prior to injection
• Subcutaneous injections may be given in the thigh, buttocks, or abdomen; rotate injection sites daily

## ADVERSE EFFECTS
**CNS:** Headache, growth of intracranial tumor, fever, aggressive behavior
**ENDO:** *Hyperglycemia, ketosis, hypothyroidism*
**GI:** Nausea, vomiting
**GU:** *Hypercalciuria*
**INTEG:** Rash, urticaria, pain, inflammation at inj site; hematoma
**MS:** Tissue swelling, joint and muscle pain
**SYST:** Antibodies to growth hormone

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (SUBCUT/IM) |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 15-60 min |

### Pharmacodynamics

| | IM/SUBCUT (growth) |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | 7 days |

## INTERACTIONS

### Drug classifications

Androgens, thyroid hormones: increased epiphyseal closure
Glucocorticosteroids: decreased growth
Insulins, antidiabetics: decreased antidiabetic effect, adjust dosage

### Drug/lab test

Increased: glucose, urine glucose
Decreased: glucose thyroid hormones

## NURSING CONSIDERATIONS

### Assessment

- Assess for signs/symptoms of diabetes
- Identify growth hormone antibodies if patient fails to respond to therapy
- Monitor thyroid function tests: $T_3$, $T_4$, $T_7$, TSH to identify hypothyroidism, thyroid hormone replacement may be needed
- Assess for allergic reaction: rash, itching, fever, nausea, wheezing
- Assess for hypercalciuria: urinary stones; groin, flank pain; nausea, vomiting, frequency, hematuria, chills
- Monitor growth rate, bone age of child at intervals during treatment
- **Respiratory infection:** in those with Prader-Willi syndrome, may have sleep apnea, upper airway obstruction; discontinue if obstruction occurs
- Rapid growth: assess for slipped capital femoral epiphysis; may also occur in endocrine disorders
- Monitor ophthalmologic status baseline and periodically, intracranial hypertension may occur
- Identify creosol or benzyl alcohol hypersensitivity before use
- **Pregnancy/breastfeeding:** Effects unknown, cautious use in breastfeeding
- **Beers:** Avoid in older adults except as hormone replacement after pituitary gland removal

### Patient/family education

- Explain reason for medication and expected results; that treatment may continue for yr
- Advise patient that routine follow-up is needed to monitor growth rate
- Instruct parents on procedure for medication preparation and inj use; request demonstration, return demonstration; provide written instructions
- Teach patient about SUBCUT injection, always rotate site to avoid tissue atrophy, do not shake, report peripheral edema, swelling to provider
- Teach patient to maintain growth record, report knee, hip pain or limping
- Advise patient treatment is very expensive

### Evaluation

**Positive therapeutic outcome**

- Growth in children until epiphyseal plates close

**⚠ HIGH ALERT**

**RARELY USED**

## sonidegib

(soe′-ni-deg′-ib)
**Odomzo**
*Func. class.:* Antineoplastic

**Uses:** Locally advanced basal cell carcinoma that has recurred following surgery or radiation therapy or in those who are not candidates for surgery or radiation therapy

## CONTRAINDICATIONS

Hypersensitivity

### Precautions:

**BLACK BOX WARNING:** Pregnancy, intrauterine fetal death, contraceptive requirement

## DOSAGE AND ROUTES

**Adults: PO** 200 mg qday until disease progression or unacceptable toxicity; take on an empty stomach ≥ 1 hr before or 2 hr after a meal. Avoid use with strong CYP3A inhibitors or strong and moderate CYP3A inducers.

**Available forms:** Cap 200 mg

**⚠ HIGH ALERT**

## sotalol (Rx)

(soe-ta′lole)
**Betapace, Betapace AF, Rylosol 🍁, Sorine, Sotylize**
*Func. class.:* Antidysrhythmic, group III
*Chem. class.:* Nonselective β-blocker

**Do not confuse:** sotalol/Sudafed

**ACTION:** Blockade of $\beta_1$- and $\beta_2$-receptors leads to antidysrhythmic effect, prolongs action potential in myocardial fibers without affecting conduction, prolongs QT interval, no effect on QRS duration

**Therapeutic outcome:** Decreased B/P, heart rate, AV conduction

## USES:
Life-threatening ventricular dysrhythmias; Betapace AF: to maintain sinus rhythm in symptomatic atrial fibrillation/flutter

## CONTRAINDICATIONS
Hypersensitivity to β-blockers, cardiogenic shock, heart block (2nd or 3rd degree), sinus bradycardia, HF, bronchial asthma, CCr <40 ml/min, hypokalemia

**BLACK BOX WARNING:** Congenital or acquired long QT syndrome

**Precautions:** Pregnancy, breastfeeding, major surgery, diabetes mellitus, renal/thyroid disease, COPD, well-compensated heart failure, CAD, nonallergic bronchospasm, electrolyte disturbances, bradycardia, peripheral vascular disease

**BLACK BOX WARNING:** Cardiac dysrhythmias, torsades de pointes, ventricular dysrhythmias, ventricular fibrillation, requires a specialized care setting

## DOSAGE AND ROUTES
**Available forms:** Tabs 80, 120, 160, 240 mg; (Betapace AF) 80, 120, 160 mg; inj 150 mg/10 ml (15 mg/ml)

### Implementation
**PO route**
- Given before meals, at bedtime, tab may be crushed or swallowed whole; give with food to prevent GI upset; reduce dosage in renal dysfunction
- Betapace and Betapace AF are not interchangeable
- Store in dry area at room temp; do not freeze

**IV route**
- Dilute to a volume of either 120 ml or 300 ml with $D_5W$, LR
- **75-mg dose:** withdraw 6 ml sotalol inj (90 mg), add 114 ml diluent to make 120 ml (0.75% mg/ml); or withdraw 6 ml sotalol inj (90 mg), add 294 ml diluent to make 300 ml (0.3 mg/ml)
- **112.5-mg dose:** withdraw 9 ml sotalol inj, (135 ml), add 111 ml diluent to 120 ml (1.125 mg/ml); or withdraw 9 ml sotalol (135 mg) and add 291 ml diluent to 300 ml (0.45 mg/ml)
- **150-mg dose:** withdraw 12 ml sotalol (180 mg), add 108 ml to 120 ml (1.5 mg/ml); or withdraw 12 ml of sotalol (180 mg), add 288 ml to 300 ml (0.6 mg/ml)
- Use inf pump and infuse 100 or 250 ml over 5 hr at a constant rate

## ADVERSE EFFECTS
**CNS:** Dizziness, mental changes, drowsiness, fatigue, headache, catatonia, depression, anxiety, nightmares, paresthesia, lethargy, insomnia, decreased concentration
**CV:** Orthostatic hypotension, bradycardia, HF, chest pain, ventricular dysrhythmias, prolonged QT, AV block, peripheral vascular insufficiency, palpitations, prodysrhythmia, torsades de pointes; Betapace AF: life-threatening ventricular dysrhythmias
**EENT:** Tinnitus, visual changes, sore throat, double vision, dry, burning eyes
**GI:** Nausea, vomiting, diarrhea, dry mouth, flatulence, constipation, anorexia, indigestion
**GU:** Impotence, dysuria, ejaculatory failure, urinary retention
**HEMA:** Agranulocytosis, thrombocytopenic purpura (rare), thrombocytopenia, leukopenia
**INTEG:** Rash, alopecia, urticaria, pruritus, fever, diaphoresis
**MISC:** Facial swelling, decreased exercise tolerance, weight change, Raynaud's disease
**MS:** Joint pain, arthralgia, muscle cramps, pain
**RESP:** Bronchospasm, dyspnea, wheezing, nasal stuffiness, pharyngitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Variable (30%) |
| **Distribution** | Crosses placenta, minimal penetration in CNS |
| **Metabolism** | Liver, protein binding 0% |
| **Excretion** | 70% unchanged—kidneys |
| **Half-life** | 10-24 hr, increased in renal disease |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | Several hr | 5-10 min |
| **Peak** | Unknown | Unknown |
| **Duration** | Unknown | Unknown |

## INTERACTIONS
### Individual drugs
**BLACK BOX WARNING:** Haloperidol, chloroquine, droperidol, pentamidine; arsenic trioxide, levomethadyl: increased QT prolongation

Insulin: increased hypoglycemia
Lidocaine: increased effects of lidocaine
Nitroglycerin: increased hypotension
Theophylline: decreased bronchodilating effects of theophylline

### Drug classifications

Antihypertensives, diuretics: increased hypotension
$\beta_2$-Agonists: decreased bronchodilating effects
Class IA/III antidysrhythmics, some phenothiazines, β-agonists, local anesthetics, tricyclics, CYP3A4 inhibitors (amiodarone, clarithromycin, erythromycin, telithromycin, troleandomycin), CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone): increased QT prolongation
Sulfonylureas: decreased hypoglycemic effects
Sympathomimetics: decreased β-blocker effects

### Drug/herb

Hawthorn: do not use concurrently

### Drug/lab test

False: increased urinary catecholamines
Interference: glucose, insulin tolerance tests

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: QT syndrome:** Monitor B/P during beginning treatment, periodically thereafter; pulse q4hr; note rate, rhythm, quality: apical/radial pulse before administration; notify prescriber of any significant changes (pulse <50 bpm); monitor ECG continuously (Betapace AF); use QT interval to determine patient eligibility; baseline QT must be ≤450 msec, if ≥500 msec, frequency or dosage must be decreased or drug must be discontinued

**BLACK BOX WARNING:** Requires a specialized care setting: for a minimum of at least 3 days on maintenance dose with continuous ECG monitoring, creatinine clearance, calculate before dosing

**BLACK BOX WARNING:** Cardiogenic shock, acute pulmonary edema: do not use, as effect can further depress cardiac output

- Check for baselines in renal function tests, before therapy begins
- Assess for edema in feet, legs daily, monitor I&O ratio, daily weight; check for jugular vein distention, crackles, bilaterally, dyspnea (HF)
- **Abrupt discontinuation:** do not discontinue abruptly; taper over 1-2 wk
- Dose should be adjusted slowly, with at least 3 days between changes; monitor ECG for QT interval
- Monitor electrolytes (hypokalemia, hypomagnesemia); may increase dysrhythmias
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed, excreted in breast milk

### Patient/family education

- Teach patient not to discontinue product abruptly, taper over 2 wk; may cause precipitate angina if stopped abruptly
- Teach patient not to use OTC products containing α-adrenergic stimulants (such as nasal decongestants, cold preparations); to avoid alcohol and smoking and to limit sodium intake as prescribed
- Teach patient how to take pulse and B/P at home, advise when to notify prescriber
- Instruct patient to comply with weight control, dietary adjustments, modified exercise program
- Caution patient to carry/wear emergency ID to identify product being taken, allergies
- Inform patient that product controls symptoms but does not cure
- Caution patient to avoid hazardous activities if dizziness, drowsiness are present
- Teach patient to report symptoms of **HF:** difficulty breathing, especially on exertion or when lying down; night cough; swelling of extremities; bradycardia; dizziness; confusion; depression; fever
- Teach patient to take product as prescribed, not to double or skip doses; take any missed doses as soon as remembered if at least 4 hr until next dose
- Teach patient that hospitalization will be required for ≥3 days

### Evaluation

**Positive therapeutic outcome**
- Absence of dysrhythmias

## spironolactone (Rx)

(speer'on-oh-lak'tone)
**Aldactone, Novo-Spiroton** 🍁
*Func. class.:* Potassium-sparing diuretic
*Chem. class.:* Aldosterone antagonist

**Do not confuse:** Aldactone/Aldactazide

**ACTION:** Competes with aldosterone at receptor sites in the distal tubule in the renal system, resulting in excretion of sodium chloride, water, retention of potassium, phosphate

**Therapeutic outcome:** Diuretic and antihypertensive effect while retaining potassium; lowered aldosterone levels

**USES:** Edema of HF, hypertension, diuretic-induced hypokalemia, primary hyperaldosteronism (diagnosis, short-term treatment, long-term

treatment), edema of nephrotic syndrome, cirrhosis of the liver with ascites

**Unlabeled uses:** HF, hirsutism in women

## CONTRAINDICATIONS

Pregnancy, hypersensitivity, anuria, severe renal disease, hyperkalemia

**Precautions:** Breastfeeding, dehydration, renal/hepatic disease, electrolyte imbalances, metabolic acidosis, gynecomastia

**BLACK BOX WARNING:** Secondary malignancy

## DOSAGE AND ROUTES

### Edema/hypertension

**Adult:** PO 25-200 mg/day in 1-2 divided doses

### HF

**Adult:** PO 12.5-25 mg/day, max 50 mg/day

### Edema

**Child:** PO 1.5-3.3 mg/kg/day in single or divided doses

### Hypertension

**Child (unlabeled):** PO 1.5-3.3 mg/kg in divided doses

### Hypokalemia

**Adult:** PO 25-100 mg/day; if PO, potassium supplements must not be used

### Primary hyperaldosteronism diagnosis

**Adult:** PO 400 mg/day × 4 days or 4 wk depending on the test, then 100-400 mg/day maintenance

### Edema (nephrotic syndrome, HF, hepatic disease)

**Adult:** PO 100 mg/day given as a single dose or in divided doses, titrate to response
**Child:** PO 1.5-3.3 mg/kg/day or 60 mg/m$^2$/day given once daily or in 2-4 divided doses

### Renal dose

**Adult:** PO CCr 10-50 ml/min; give dose q12-24hr; CCr <10 ml/min, avoid use

### Polycystic ovary syndrome/hirsutism in women (unlabeled)

**Adult:** PO 50-200 mg in 1-2 divided doses

**Available forms:** Tabs 25, 50, 100 mg

### Implementation

- Give in AM to avoid interference with sleep
- Give with food if nausea occurs; absorption may be increased; take at same time each day
- Effect may take 2 wk

## ADVERSE EFFECTS

**CNS:** Headache, confusion, drowsiness, lethargy, ataxia
**ELECT:** Hyperchloremic metabolic acidosis, hyperkalemia, hyponatremia
**ENDO:** Impotence, gynecomastia, irregular menses, amenorrhea, postmenopausal bleeding, hirsutism, deepening voice, breast pain
**GI:** Diarrhea, cramps, bleeding, gastritis, vomiting, anorexia, nausea, hepatocellular toxicity
**HEMA:** Agranulocytosis
**INTEG:** *Rash, pruritus,* urticaria

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | GI tract; well absorbed |
| **Distribution** | Crosses placenta |
| **Metabolism** | Liver to canrenone (active metabolite) |
| **Excretion** | Renal; breast milk |
| **Half-life** | 12-24 hr (canrenone) |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 24-48 hr |
| **Peak** | 48-72 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Aspirin: decreased action of spironolactone
Cholestyramine: increased hyperchloremic acidosis in cirrhosis
Digoxin: increased digoxin action
Lithium: increased action, toxicity

### Drug classifications

ACE inhibitors, diuretics (potassium-sparing), angiotensin II receptor antagonists potassium products, salt substitute: increased hyperkalemia
Anticoagulants: decreased effects of anticoagulants, monitor INR/PT
Antihypertensives: increased action
NSAIDs: decreased effect of spironolactone

### Drug/food

Potassium-rich foods, potassium salt substitutes: increased hyperkalemia

### Drug/herb

Ephedra: decreased antihypertensive effect
Hawthorn, horse chestnut: increased hypotension
St. John's wort: severe photosensitivity

### Drug/lab test

Increased: BUN, potassium
Decreased: sodium, magnesium
Interference: 17-OHCS, 17-KS, radioimmunoassay, digoxin assay

## NURSING CONSIDERATIONS

### Assessment

- **Hypokalemia:** assess for polyuria, polydipsia, dysrhythmias including a U wave on ECG
- **Hyperkalemia:** assess for weakness, fatigue, dyspnea, dysrhythmias, confusion
- HF assessment daily: Assess fluid volume status: I&O ratios and record, count or weigh diapers as appropriate, weight, distended red veins, crackles in lung, color, quality, and specific gravity of urine, skin turgor, adequacy of pulses, moist mucous membranes, bilateral lung sounds, peripheral pitting edema; dehydration symptoms of decreasing output, thirst, hypotension, dry mouth and mucous membranes should be reported, potassium must be checked within 3 days, 1 wk, 1 mo × 3, then q3mo, recheck after starting products that alter potassium
- Monitor electrolytes: potassium, sodium, calcium, magnesium; also include BUN, ABGs, uric acid, CBC, blood glucose
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, fetal harm has occurred, do not breastfeed, excreted in breast milk

**BLACK BOX WARNING:** Secondary malignancy: assess periodically

- **Beers:** Avoid in older adults with heart failure or CCr <30 ml/min

### Patient/family education

- Teach patient to take medication early in day to prevent nocturia
- Instruct patient to take with food or milk if GI symptoms of nausea and anorexia occur
- Teach patient to maintain a record of weight on a weekly basis and notify prescriber of weight loss of >5 lb
- Caution patient that this product causes an increase in potassium levels, that foods high in potassium should be avoided: oranges, bananas, salt substitutes, dried apricots, dates; avoid potassium salt substitutes; refer to dietitian for assistance planning
- Teach patient to take in AM, to prevent sleeplessness
- Teach patient to avoid hazardous activities until reaction is known
- Teach patient to notify prescriber if pregnancy is planned or suspected, pregnancy do not breastfeed
- Teach patient not to use alcohol or any OTC medications without prescriber's approval; serious product reactions may occur
- Emphasize the need to contact prescriber immediately if muscle cramps, weakness, nausea, dizziness, or numbness occur
- Teach patient to take own B/P and pulse and record
- Teach patient to notify prescriber of cramps, diarrhea, lethargy, thirst, headache, skin rash, menstrual abnormalities, deepening voice, breast enlargement
- Advise patient that dizziness and confusion may occur; avoid driving or other hazardous activities if alertness is decreased
- Teach patient to continue taking medication even if feeling better; this product controls symptoms but does not cure the condition
- Advise patient with hypertension to continue other treatment (exercise, weight loss, relaxation techniques, cessation of smoking)

### Evaluation

**Positive therapeutic outcome**

- Prevention of hypokalemia (diuretic use)
- Decreased edema
- Decreased B/P
- Decreased aldosterone levels
- Increased diuresis

## TREATMENT OF OVERDOSE

- Lavage if taken orally, monitor electrolytes
- Administer sodium bicarbonate
- Monitor hydration, CV, renal status

## stavudine d4t (Rx)

(sta′vu-deen)
**Zerit**
*Func. class.:* Antiretroviral
*Chem. class.:* Nucleoside reverse transcriptase inhibitor (NRTI)

**Do not confuse:** stavudine/cetirizine
Zerit/ZyrTEC

**ACTION:** Prevents replication of HIV-1 by inhibition of reverse transcriptase; causes DNA chain termination

**Therapeutic outcome:** Decreasing diarrhea, fatigue, night sweats; increased body weight

**USES:** Treatment of HIV-1; used in combination with other antiretrovirals

## CONTRAINDICATIONS

Hypersensitivity to this product or zidovudine, didanosine, zalcitabine; severe peripheral neuropathy

**Precautions:** Breastfeeding, advanced HIV infections, bone marrow suppression, renal, peripheral neuropathy, osteoporosis, obesity, pregnancy

S

**BLACK BOX WARNING:** Hepatic disease, pancreatitis, lactic acidosis

## DOSAGE AND ROUTES

**Adult >60 kg:** PO 40 mg q12hr
**Adult <60 kg:** PO 30 mg q12hr
**Child <30 kg:** PO 1 mg/kg q12hr
**Child ≥30 kg ≤60 kg:** PO 30 mg q12hr
**Child >60 kg:** PO 40 mg q12hr

### Renal dose

**Adult >60 kg:** CCr 26-50 ml/min 20 mg q12hr; CCr 10-25 ml/min 20 mg q24hr
**Adult <60 kg:** CCr 26-50 ml/min 15 mg q12hr; CCr 10-25 ml/min 15 mg q24hr

**Available forms:** Caps 15, 20, 30, 40 mg; oral powder for sol 1 mg/ml

### Implementation

- Give with or without meals; absorption does not appear to be lowered when taken with food
- Give product q4hr around the clock, even during night
- Shake susp well before using
- Use after hemodialysis

## ADVERSE EFFECTS

**CNS:** *Peripheral neuropathy,* insomnia, anxiety, depression, dizziness, confusion, *headache,* chills/fever, malaise, neuropathy
**CV:** Chest pain, vasodilatation, hypertension
**EENT:** Conjunctivitis, abnormal vision
**GI:** Hepatotoxicity, *diarrhea, nausea, vomiting,* anorexia, dyspepsia, constipation, stomatitis, pancreatitis
**HEMA:** Bone marrow suppression, leukopenia, macrocytosis
**INTEG:** *Rash,* sweating, pruritus, benign neoplasms
**MISC:** Lactic acidosis, asthenia, lipodystrophy
**MS:** Myalgia, arthralgia
**RESP:** Dyspnea, pneumonia, asthma

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed, 82% bioavailability |
| **Distribution** | Cerebrospinal fluid |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | Elimination: 1-1.6 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Chloramphenicol, dapsone, didanosine, ethambutol, hydrALAZINE, lithium, phenytoin, vinCRIStine, zalcitabine: increased peripheral neuropathy
Methadone, zidovudine: decreased stavudine effect
Probenecid: increased stavudine levels

### Drug classifications

Myelosuppressants: increased myelosuppression

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Assess for lactic acidosis and severe hepatomegaly with steatosis; death may result; monitor LFTs

- Monitor viral load and CD4 counts, plasma HIV RNA baseline, throughout treatment
- Monitor for peripheral neuropathy: tingling, pain in extremities; if these occur, discontinue product, may not resolve after treatment is discontinued

**BLACK BOX WARNING: Monitor for pancreatitis:** severe upper abdominal pain, weakness, fatigue, dyspnea, nausea, vomiting throughout treatment; if these occur, discontinue product

- Monitor blood tests: WBC, differential, RBC, Hct, Hgb, platelets, serum amylase, lipase, blood glucose, plasma hepatitis CRNA, pregnancy test, serum cholesterol, serum lipids, hepatitis serology, baseline and periodically
- Monitor renal function tests: urinalysis, protein, blood, serum creatinine
- Lipoatrophy/lipodystrophy during treatment
- Monitor bowel pattern before, during treatment
- Monitor fluid overload; product requires large volume to stay in sol
- Assess for weakness, tremors, confusion, dizziness, psychosis; if these occur, product may have to be decreased or discontinued
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, register pregnant patient in the Antiretroviral Pregnancy Registry 800-258-4263, do not breastfeed

### Patient/family education

- Teach patient signs of peripheral neuropathy: burning, weakness, pain, pricking feeling in the extremities
- Caution patient that this product should not be given with antineoplastics
- Inform patient that GI complaints and insomnia resolve after 3-4 wk of treatment

• Inform patient that product is not a cure for AIDS but controls symptoms
• Advise patient to call prescriber if sore throat, swollen lymph nodes, malaise, fever occur; may indicate presence of other infections
• Caution patient that even with product administration, virus is still infective and may be passed on to others
• Caution patient that follow-up visits must be continued because serious toxicity may occur; blood counts must be done q2wk
• Teach patient that product must be taken q4hr around the clock even during night
• Caution patient that serious product interactions with other medications may occur, check with prescriber first if taking chloramphenicol, dapsone, cisplatin, didanosine, ethambutol, lithium, antifungals
• Teach patient to notify prescriber if pregnancy is planned or suspected, fatal lactic acidosis may occur, pregnancy avoid breastfeeding
• Inform patient that other products may be necessary to prevent other infections
• Inform patient that product may cause fainting or dizziness

### Evaluation

**Positive therapeutic outcome**
• Decreased symptoms of HIV infection

**⚠ HIGH ALERT**

## succinylcholine (Rx)

(suk-sin-ill-koe′leen)
**Anectine, Quelicin**
*Func. class.:* Neuromuscular blocker (depolarizing—ultra short)

**ACTION:** Inhibits transmission of nerve impulses by binding with cholinergic receptor sites, antagonizing action of acetylcholine; causes release of histamine

**Therapeutic outcome:** Paralysis of skeletal muscles

**USES:** Facilitation of endotracheal intubation, skeletal muscle relaxation during orthopedic manipulations

## CONTRAINDICATIONS

Hypersensitivity, malignant hyperthermia, trauma

**Precautions:** Pregnancy, breastfeeding, geriatric or debilitated patients, severe burns, fractures (fasciculation may increase damage), electrolyte imbalances, dehydration, neuromuscular disease, respiratory disease, collagen diseases, glaucoma, eye surgery, renal/hepatic/cardiac disease, hyperkalemia

**BLACK BOX WARNING:** Myopathy, rhabdomyolysis, children <2 yr

## DOSAGE AND ROUTES

**Adult: IV** 0.3-1.1 mg/kg, max 150 mg, maintenance 0.04-0.07 mg/kg q5-10min as needed; CONT **IV** INF dilute to concentration of 1-2 mg/ml in $D_5W$ or NS 10-100 mcg/kg/min
**Child: IV** initially 1-2 mg/kg; CONT **IV** INF not recommended

**Available forms:** Inj 20, 50, 100 mg/ml; powder for inj 100, 500 mg/vial, 1 g/vial

### Implementation

• Store in refrigerator, powder at room temp; close tightly
• Give IV or IM; only experienced clinicians familiar with the use of neuromuscular blocking drugs should administer or supervise the use of this product
• Visually inspect parenteral products for particulate matter and discoloration prior to use
• Monitor heart rate and mechanical ventilator status during use

**Rapid IV injection route**
• Due to tachyphylaxis and prolonged apnea, this method is not recommended for prolonged procedures. Rapid IV injection of succinylcholine may result in profound bradycardia or asystole in pediatric patients; as with adults, the risk increases with repeated doses. Pretreatment with atropine may be needed
• No dilution of injection solution necessary
• Inject rapidly IV over 10-30 seconds

**Continuous IV infusion route**
• Not recommended for infants and children due to risk of malignant hyperthermia
• This route is preferred for long surgical procedures due to possible tachyphylaxis and prolonged apnea associated with administration of repeated fractional doses
• Dilute succinylcholine to a concentration of 1-2 mg/ml with $D_5W$, $D_5NS$, NS, or 1/6 M sodium lactate injection. One g of the powder for injection or 20 ml of a 50-mg/ml solution may be added to 1 L or 500 ml of diluent to give solutions containing 1 or 2 mg/ml, respectively. Alternatively, 500 mg of the powder for injection or 10 ml of a 50 mg/ml solution may be added to 500 ml or 250 ml of diluent to give solutions containing 1 or 2 mg/ml, respectively
• Infuse IV at a rate of 2.5 mg/min (range = 0.5-10 mg/min); adjust rate based on patient response and requirements

S

**IM route**
- Recommended for infants and other patients in whom a suitable vein is not accessible
- Inject into a large muscle, preferably high into the deltoid muscle. Aspirate prior to injection

**Y-site compatibilities:** Etomidate, heparin, potassium chloride, propofol, vit B/C

**Additive incompatibilities:** Barbiturates, nafcillin, sodium bicarbonate

## ADVERSE EFFECTS

**CV:** Bradycardia, tachycardia; increased, decreased B/P, sinus arrest, dysrhythmias, edema
**EENT:** Increased secretions, increased intraocular pressure
**HEMA:** Myoglobulinemia
**INTEG:** Rash, flushing, pruritus, urticaria
**MS:** Weakness, muscle pain, fasciculation, prolonged relaxation, myalgia, rhabdomyolysis
**RESP:** Prolonged apnea, bronchospasm, cyanosis, respiratory depression, wheezing, dyspnea
**SYST:** Anaphylaxis, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (IM) |
| **Distribution** | Widely distributed, crosses placenta |
| **Metabolism** | Plasma (90%) |
| **Excretion** | Hydrolyzed in blood, excreted in urine (active/inactive metabolites) |
| **Half-life** | Unknown |

### Pharmacodynamics

| | IM | IV |
|---|---|---|
| **Onset** | 2-3 min | 1 min |
| **Peak** | Unknown | 2-3 min |
| **Duration** | 10-30 min | 6-10 min |

## INTERACTIONS

### Individual products

Clindamycin, enflurane, isoflurane, lincomycin, lithium, oxytocin, procainamide, quiNIDine: increased neuromuscular blockade
Theophylline: increased dysrhythmias

### Drug classifications

Aminoglycosides, anesthetics (local), antibiotics (polymyxin), β-adrenergic blockers, cardiac glycosides, magnesium salts, opioids, thiazides: increased neuromuscular blockade

### Drug/herb

Melatonin: blocks succinylcholine

## NURSING CONSIDERATIONS

### Assessment

- Assess for electrolyte imbalances (potassium, magnesium); may lead to increased action of this product
- Monitor VS (B/P, pulse, respirations, airway) until fully recovered; rate, depth, pattern of respirations, strength of hand grip
- Monitor I&O ratio; check for urinary retention, frequency, hesitancy
- **Recovery:** assess for decreased paralysis of face, diaphragm, leg, arm, rest of body
- **Allergic reactions:** assess for rash, fever, respiratory distress, pruritus; product should be discontinued if these occur
- Assess temperature for malignant hyperthermia, previous reactions to anesthesia, or paralytics
- **Pregnancy/breastfeeding:** Use only if clearly needed, cautious use in breastfeeding, excretion unknown

**BLACK BOX WARNING: Myopathy, rhabdomyolysis:** in pediatric patients (rare)

### Patient/family education

- Explain reason for medication and expected results
- Provide reassurance if communication is difficult during recovery from neuromuscular blockade; postoperative stiffness is normal, soon subsides

### Evaluation

**Positive therapeutic outcome**
- Paralysis of jaw, eyelid, head, neck, rest of body

## TREATMENT OF OVERDOSE:

Neostigmine, atropine, monitor VS; may require mechanical ventilation

## sucralfate (Rx)

(soo-kral′fate)
**Carafate, Sulcrate**
*Func. class.:* Protectant; antiulcer
*Chem. class.:* Aluminum hydroxide/sulfated sucrose

**Do not confuse:** Carafate/Cafergot

**ACTION:** Forms a complex that adheres to ulcer site, adsorbs pepsin

**Therapeutic outcome:** Healing of ulcers

**USES:** Duodenal ulcer, oral mucositis, stomatitis after radiation of head and neck

**Unlabeled uses:** Gastric ulcers, gastroesophageal reflux

## CONTRAINDICATIONS
Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, renal failure, hypoglycemia (diabetics)

## DOSAGE AND ROUTES
### Duodenal ulcers
**Adult:** PO 1 g qid 1 hr before meals and at bedtime
**Child:** PO 40-80 mg/kg/day divided

**Available forms:** Tabs 1 g; oral susp 1 g/10 ml

### Implementation
- Do not break, crush, or chew tabs
- Give on empty stomach 1 hr before meals and at bedtime
- Avoid antacids ½ hr before or 1 hr after taking this product
- Store at room temperature

## ADVERSE EFFECTS
**GI:** *Dry mouth, constipation,* bezoar (critically ill patients)

### Pharmacokinetics
| | |
|---|---|
| **Absorption** | Minimally absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Not metabolized |
| **Excretion** | Feces (90%) |
| **Half-life** | 6-20 hr |

### Pharmacodynamics
| | |
|---|---|
| **Onset** | ½ hr |
| **Peak** | Unknown |
| **Duration** | 6 hr |

## INTERACTIONS
### Individual drugs
Cimetidine, ranitidine: decreased absorption of sucralfate
Digoxin, ketoconazole, phenytoin, tetracycline, theophylline: decreased action of each specific product

### Drug classifications
Antacids: decreased absorption of sucralfate
Fat-soluble vitamins: decreased action of fat-soluble vitamins
Fluoroquinolones: decreased absorption

## NURSING CONSIDERATIONS
### Assessment
- **GI symptoms:** assess for abdominal pain, blood in stools
- **Hypoglycemia:** may occur in those with diabetes mellitus, monitor blood glucose carefully

### Patient/family education
- Instruct patient to take medication on empty stomach
- Caution patient to take full course of therapy, not to use >8 wk, to avoid smoking
- Caution patient to take 2 hr after product, to avoid antacids, milk alkalotics, water within 2 hr of the product
- Advise patient to increase fluids, bulk, exercise to lessen constipation

### Evaluation
**Positive therapeutic outcome**
- Absence of pain or GI complaints

## sulfamethoxazole/trimethoprim (cotrimoxazole) (Rx)
(sul-fa-meth-ox′a-zole/trye-meth′oh-prim [ko-trye-mox′a-zole])
**Apo-Sulfatrim, Bacter-Aid DS, Bactrim DS, Novo-Trimel, Nu-Cotrimox, Septra, Protin DF, Septra DS, SMZ/TMP, Sultrex**
*Func. class.:* Antiinfective
*Chem. class.:* Sulfonamide—miscellaneous

**ACTION:** Sulfamethoxazole (SMZ) interferes with bacterial biosynthesis of proteins by competitive antagonism of PABA when adequate levels are maintained; trimethoprim (TMP) blocks synthesis of tetrahydrofolic acid; combination blocks two consecutive steps in bacterial synthesis of essential nucleic acids, protein

**Therapeutic outcome:** Absence of infection, based on C&S

**USES:** UTI, otitis media, acute and chronic prostatitis, shigellosis, chancroid, traveler's diarrhea, *Enterobacter, Escherichia coli, Haemophilus influenzae* (beta-lactamase negative), *Haemophilus influenzae* (beta-lactamase positive), *Klebsiella, Morganella morganii, Pneumocystis carinii, Pneumocystis jiroveci, Proteus mirabilis, Proteus, Shigella flexneri, Shigella sonnei, Streptococcus* pneumonia; **may also be effective for** *Acinetobacter baumannii, Actinomadura madurae, Actinomadura pelletieri, Bordetella pertussis, Burkholderia pseudomallei, Cyclospora cayetanensis, Haemophilus ducreyi, Isospora belli, Klebsiella granulomatis, Legionella micdadei, Legionella pneumophila, Listeria monocytogenes, Moraxella catarrhalis, Neisseria gonorrhoeae, Nocardia asteroides, Nocardia brasiliensis,*

S

*Nocardia otitidiscaviarum, Pediculus capitis, Plasmodium falciparum, Providencia, Salmonella, Serratia, Shigella, Staphylococcus aureus* (MRSA), *Staphylococcus aureus* (MSSA), *Staphylococcus epidermidis, Stenotrophomonas maltophilia, Streptococcus pyogenes* (group A beta-hemolytic streptococci), *Streptomyces somaliensis, Toxoplasma gondii, Vibrio cholerae, Viridans* streptococci, *Yersinia enterocolitica*

## CONTRAINDICATIONS

Pregnancy at term, breastfeeding, infants <2 mo, hypersensitivity to trimethoprim or sulfonamides, megaloblastic anemia, CCr <15 ml/min

**Precautions:** Pregnancy **C,** infants, geriatric, renal disease, G6PD deficiency, impaired renal/hepatic function, possible folate deficiency, severe allergy, bronchial asthma, UV exposure, porphyria, hyperkalemia, hypothyroidism

## DOSAGE AND ROUTES

Based on TMP content

### UTI

**Adult:** PO 160 mg TMP q12hr × 10-14 days
**Child:** PO 8 mg/kg TMP daily in 2 divided doses q12hr (treatment); 2 mg/kg/day (prophylaxis)

### Otitis media

**Child:** PO 8 mg/kg TMP daily in 2 divided doses q12hr × 10 days

### Chronic bronchitis

**Adult:** PO 160 mg TMP q12hr × 10-14 days

### *Pneumocystis jiroveci* pneumonitis

**Adult and child:** PO 15-20 mg/kg TMP daily in 4 divided doses q6hr × 14-21 days; **IV** 15-20 mg/kg/day (based on TMP) in 3-4 divided doses for up to 14 days

### Renal dose

Dosage reduction necessary in moderate to severe renal impairment (CCr <30 ml/min)

**Available forms:** Tabs 80 mg TMP/400 mg SMZ, 160 mg TMP/800 mg SMZ; susp 200 mg-40 mg/5 ml, 800 mg-160 mg/20 ml; **IV** 16 mg/80 mg/ml

### Implementation

- Give with full glass of water to maintain adequate hydration; increase fluids to 2 L/day to decrease crystallization in kidneys
- Give medication after C&S; repeat C&S after full course of medication
- Store in airtight, light-resistant container at room temp
- Give without regard to meals

**Intermittent IV infusion route**

- Dilute 5 ml ampule/100-125 ml of $D_5W$, stable for 6 hr, give over ½ hr, do not refrigerate, if using Septra ADD-Vantage vials dilute each 10-ml vial in ADD-Vantage diluent containers containing 250 ml of $D_5W$, infuse over 60-90 min, change site q48-72hr

**Y-site compatibilities:** Acyclovir, aldesleukin, allopurinol, amifostine, atracurium, aztreonam, cefepime, cyclophosphamide, diltiazem, enalaprilat, esmolol, filgrastim, fludarabine, gallium, granisetron, HYDROmorphone, labetalol, LORazepam, magnesium sulfate, melphalan, meperidine, morphine, pancuronium, perphenazine, piperacillin/tazobactam, sargramostim, tacrolimus, teniposide, thiotepa, vecuronium, zidovudine

**Y-site incompatibilities:** Alfentanil, amikacin, aminophylline, amphotericin B colloidal, ampicillin, ampicillin/sulbactam, ascorbic acid, atropine, azaTHIOprine, benztropine, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, caspofungin, ceFAZolin, cefotaxime, cefOXitin, cefTAZidime, cefTRIAXone, chloramphenicol, chlorproMAZINE, cimetidine, clindamycin, codeine, cyanocobalamin, cycloSPORINE, dantrolene, dexamethasone, diazepam, diazoxide, digoxin, diphenhydrAMINE, DOBUTamine, DOPamine, DOXOrubicin, doxycycline, ePHEDrine, EPINEPHrine, epirubicin, epoetin alfa, erythromycin, famotidine, fentaNYL, fluconazole, folic acid, furosemide, ganciclovir, gentamicin, glycopyrrolate, haloperidol, heparin, hydrALAZINE, hydrocortisone, hydrOXYzine, IDArubicin, imipenem/cilastatin, inamrinone, indomethacin, insulin, isoproterenol, ketorolac, lidocaine, mannitol, mechlorethamine, metaraminol, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, multi-vitamins, nafcillin, nalbuphine, naloxone, nitroglycerin, nitroprusside, norepinephrine, ondansetron, oxacillin, oxytocin, papaverine, penicillin G, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, phenytoin, phytonadione, potassium chloride, procainamide, prochlorperazine, promethazine, propranolol, protamine, quinupristin/dalfopristin, ranitidine, sodium bicarbonate, succinylcholine, SUFentanil, thiamine, ticarcillin/clavulanate, tobramycin, tolazoline, trimetaphan, urokinase, vancomycin, verapamil, vinorelbine

## ADVERSE EFFECTS

**CNS:** Headache, insomnia, hallucinations, depression, vertigo, fatigue, anxiety, seizures, drug fever, chills, aseptic meningitis

**CV:** Allergic myocarditis
**EENT:** Tinnitus
**GI:** *Nausea, vomiting, abdominal pain,* stomatitis, hepatitis, glossitis, pancreatitis, diarrhea, enterocolitis, anorexia, pseudomembranous colitis
**GU:** Renal failure, toxic nephrosis; increased BUN, creatinine; crystalluria
**HEMA:** Leukopenia, neutropenia, thrombocytopenia, agranulocytosis, hemolytic anemia, hypoprothrombinemia, Henoch-Schölein purpura, methemoglobinemia, eosinophilia
**INTEG:** Rash, dermatitis, urticaria, erythema, photosensitivity, pain, inflammation at injection site, toxic epidermal necrolysis, erythema multiforme
**RESP:** Cough, shortness of breath
**SYST:** Anaphylaxis, systemic lupus erythematosus, Stevens-Johnson syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid |
| **Distribution** | Breast milk, crosses placenta, 68% protein bound |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | 8-13 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

CycloSPORINE: decreased response
Dofetilide: increased levels of dofetilide
Methenamine: increased crystalluria
Methotrexate: increased bone marrow depression
Phenytoin: decreased hepatic clearance of phenytoin

### Drug classifications

Anticoagulants (oral): increased anticoagulant effect
CYP2C9, CYP3A4 inducers: decreased hepatic clearance
Diuretics (potassium-sparing), potassium supplements: increased potassium levels
Diuretics (thiazide): increased thrombocytopenia
Sulfonylureas: increased hypoglycemic response

### Drug/lab test

Increased: creatinine, bilirubin
Decreased: Hgb, platelets

## NURSING CONSIDERATIONS

### Assessment

- Monitor I&O ratio; note color, character, pH of urine if product administered for UTI; output should be 800 ml less than intake; if urine is highly acidic, alkalization may be needed
- Monitor renal function tests: BUN, creatinine, urinalysis (long-term therapy)
- Assess type of infection; obtain C&S before starting therapy
- Assess blood dyscrasias, skin rash, fever, sore throat, bruising, bleeding, fatigue, joint pain
- Assess allergic reaction: rash, dermatitis, urticaria, pruritus, dyspnea, bronchospasm, AIDS patients are more susceptible, identify if patient has a sulfa allergy
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, may be harmful to fetus, do not breastfeed

### Patient family education

- Teach patient to take each oral dose with full glass of water to prevent crystalluria; drink 8-10 glasses of water/day
- Teach patient to complete full course of treatment to prevent superinfection
- Teach patient to avoid sunlight or use sunscreen to prevent burns
- Teach patient to avoid OTC medications (aspirin, vit C) unless directed by prescriber
- If diabetic, teach patient to use Clinistix or Tes-Tape
- Teach patient to use alternative contraceptive measures; decreased effectiveness of oral contraceptives may result
- Teach patient to notify prescriber if skin rash, sore throat, fever, mouth sores, unusual bruising, bleeding occur

### Evaluation

**Positive therapeutic outcome**

- Absence of pain, fever, C&S negative

## sulfaSALAzine (Rx)

(sul-fa-sal'a-zeen)
**Azulfidine, Azulfidine EN-tabs, Salazopyrin, Salazopyrin EN-tabs** 🍁
*Func. class.:* GI Antiinflammatory, antirheumatic (DMARD)
*Chem. class.:* GI Sulfonamide

**Do not confuse:** sulfaSALAzine/sulfiSOXAZOLE

**ACTION:** Proproduct to deliver sulfapyridine and 5-aminosalicylic acid to colon; antiinflammatory in connective tissue

**Therapeutic outcome:** Treatment of ulcerative colitis, rheumatoid arthritis

## USES:
Ulcerative colitis, rheumatoid arthritis, juvenile rheumatoid arthritis (Azulfidine EN-tabs)

**Unlabeled uses:** Crohn's disease

## CONTRAINDICATIONS
Pregnancy at term, children <2 yr, hypersensitivity to sulfonamides or salicylates, intestinal, urinary obstruction, porphyria

**Precautions:** Pregnancy, breastfeeding, impaired renal/hepatic function, severe allergy, bronchial asthma, megaloblastic anemia

## DOSAGE AND ROUTES
### Bowel disease
**Adult:** PO 3-4 g/day in divided doses; maintenance 2 g/day in divided doses q6hr
**Child ≥6 yr:** PO 40-60 mg/kg/day in 4-6 divided doses, then 30 mg/kg/day in 4 doses, max 2 g/day

### Rheumatoid arthritis
**Adult:** PO 0.5-1 g/day, then increase daily dose by 500 mg qwk to 2 g/day in 2-3 divided doses

### Juvenile rheumatoid arthritis
**Child ≥6 yr:** PO 30-50 mg/kg/24 hr, divided into 2 doses

### Renal dose
**Adult:** PO CCr 10-30 ml/min give bid; CCr <10 ml/min give daily

**Available forms:** Tabs 500 mg; oral susp 250 mg/5 ml; del rel tabs 500 mg

### Implementation
- Give with full glass of water to maintain adequate hydration; increase fluids to 2 L/day to decrease crystallization in kidneys; contact lenses, urine, skin may be yellow-orange
- Give total daily dose in evenly spaced doses and after meals to help minimize GI intolerance
- Give at bedtime
- Store in airtight, light-resistant container at room temperature

## ADVERSE EFFECTS
**CNS:** Headache, confusion, insomnia, hallucinations, depression, vertigo, fatigue, anxiety, seizures, drug fever, chills
**CV:** Allergic myocarditis
**GI:** *Nausea, vomiting, abdominal pain,* stomatitis, hepatitis, glossitis, pancreatitis, diarrhea
**GU:** Renal failure, toxic nephrosis, increased BUN, creatinine, crystalluria
**HEMA:** Leukopenia, neutropenia, thrombocytopenia, agranulocytosis, hemolytic anemia
**INTEG:** Rash, dermatitis, urticaria, Stevens-Johnson syndrome, erythema, photosensitivity
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Partially absorbed |
| **Distribution** | Crosses placenta |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 6 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 1 hr |
| **Peak** | 1½-6 hr |
| **Duration** | 6-12 hr |

## INTERACTIONS
### Individual drugs
AzaTHIOprine, mercaptopurine: increased leucopenia risk
CycloSPORINE: decreased effect of cycloSPORINE
Digoxin: decreased digoxin effect
Folic acid: decreased folic acid effect
Methotrexate: decreased renal excretion

### Drug classifications
Anticoagulants (oral): increased anticoagulant effect
Hypoglycemics (oral): increased hypoglycemic response

### Drug/food
Iron, folic acid will be poorly absorbed

### Drug/lab test
False positive: urinary glucose test

## NURSING CONSIDERATIONS
### Assessment
- Monitor I&O ratio; note color, amount, character, pH of urine if product administered for UTIs; output should be 800 ml less than intake; if urine is highly acidic, alkalization may be needed
- Monitor kidney function tests: BUN, creatinine, urinalysis if on long-term therapy
- **Blood dyscrasias:** assess for rash, fever, sore throat, bruising, bleeding, fatigue, joint pain; monitor CBC before and q3mo
- **Allergic reaction:** assess for rash, dermatitis, urticaria, pruritus, dyspnea, bronchospasm, identify sulfa, salicylate allergy
- **Ulcerative colitis, proctitis, other inflammatory bowel disease:** monitor character, amount, consistency of stools, abdominal pain, cramping, blood, mucus

• **Rheumatoid arthritis:** assess mobility, joint swelling, pain, activities of daily living
• **Pregnancy/breastfeeding: Use only if clearly needed, cautious use in breastfeeding, excreted in breast milk**

### Patient/family education

• Advise patient to take each oral dose with full glass of water to prevent crystalluria
• Teach patient to avoid sunlight or to use sunscreen to prevent burns
• Teach patient to avoid OTC medication (aspirin, vit C) unless directed by prescriber
• Advise patient to notify prescriber if skin rash, sore throat, fever, mouth sores, unusual bruising, bleeding occur
• Advise patient to use rectal susp at bedtime and retain all night
• Advise patient that decreased sperm production may occur and resolves after completion of product
• Notify prescriber if enteric-coated tablets are seen in the stool, discontinue if present

### Evaluation

**Positive therapeutic outcome**
• Absence of fever, mucus in stools or pain in joints

## SUMAtriptan (Rx)

(soo-ma-trip'tan)
**ALSUMA Auto-injector, Imitrex, Sumavel Dose Pro, Zecuity**
*Func. class.:* Antimigraine agent
*Chem. class.:* 5-$HT_1$ receptor agonist

**Do not confuse:** SUMAtriptan/somatropin

**ACTION:** Binds selectively to the vascular 5-$HT_1$ receptor subtype and exerts antimigraine effect; causes vasoconstriction in cranial arteries

**Therapeutic outcome:** Absence of migraines

**USES:** Acute treatment of migraine with or without aura and cluster headache

## CONTRAINDICATIONS

Angina pectoris, history of MI, documented silent ischemia, Prinzmetal's angina, ischemic heart disease, **IV** use, concurrent ergotamine-containing preparations, uncontrolled hypertension, hypersensitivity, basilar or hemiplegic migraine

**Precautions:** Pregnancy, breastfeeding, children <18 yr, postmenopausal women, men >40 yr, geriatric, risk factors for CAD, hypercholesterolemia, obesity, diabetes, impaired renal/hepatic function, overuse

## DOSAGE AND ROUTES

**Adult:** SUBCUT 6 mg or less, may repeat in 1 hr, max 12 mg/24 hr; PO 25 mg with fluids if no relief in 2 hr, give another dose, max 200 mg/day; NASAL 1 dose of 5, 10, or 20 mg in one nostril, may repeat in 2 hr, max 40 mg/24 hr, 1 puff each nostril q2hr; TD 1 patch (6.5 mg/4 hr); after application push activation button

### Hepatic dose

**Adult:** PO 25 mg, if no response after 2 hr, give up to 50 mg

**Available forms:** Inj 4, 6 mg/0.5 ml; tabs 25, 50, 100 mg; nasal spray 5 mg/100 mcl-units dose spray device 20 mg/100 mcl-units; transdermal patch 6.5 mg/4 hr

### Implementation

**PO route**
• Swallow tab whole; do not break, crush, or chew
• Take with fluids as soon as symptoms appear; may take a second dose >4 hr, max 200 mg/24 hr

**SUBCUT route**
• Give by SUBCUT route only, avoid IM or **IV** administration, use only for actual migraine attack
• Give 1st dose supervised by medical staff in those with CAD or those at risk for CAD

**Nasal route**
• Spray once in 1 nostril, may repeat if headache returns, do not repeat if pain continues after 1st dose

**Transdermal route**
• Do not cut; apply to dry, intact skin of upper arm or thigh; do not use over scars, tattoos, cuts, scratches, burns, abrasions
• Apply another patch if headache is not relieved ≥2 hr after 1st patch; push activation button within 15 min of applying or patch will not work; do not bathe, shower, swim; may be taped with medical tape if needed
• Do not use with MRI
• Remove slowly, cleanse with soap and water, may cause redness
• Dispose of after folding in half

## ADVERSE EFFECTS

**CNS:** *Tingling, hot sensation, burning, feeling of pressure, tightness, numbness, dizziness, sedation,* headache, anxiety, fatigue, cold sensation
**CV:** *Flushing,* MI, hypo/hypertension
**EENT:** Throat, mouth, nasal discomfort, vision changes
**GI:** Abdominal discomfort
**INTEG:** *Inj site reaction,* sweating
**MS:** *Weakness, neck stiffness,* myalgia
**RESP:** Chest tightness, pressure

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (SUBCUT) |
| **Distribution** | 10%-20% plasma protein binding |
| **Metabolism** | Liver (metabolite) |
| **Excretion** | Urine, feces |
| **Half-life** | 2 hr |

### Pharmacodynamics

| | SUBCUT |
|---|---|
| **Onset** | 10-20 min |
| **Peak** | 10 min-2 hr |
| **Duration** | Up to 24 hr (pain relief) |

## INTERACTIONS

### Individual drugs

Ergotamine: increased risk of vasospastic reaction

### Drug classifications

Ergot derivatives: extended vasospastic effects
MAOIs, SSRIs, SNRIs, serotonin-receptor agonists: increased SUMAtriptan levels

### Drug/herb

SAM-e, St. John's wort: serotonin syndrome

## NURSING CONSIDERATIONS

### Assessment

- **Serotonin syndrome:** assess for delirium, coma, agitation, diaphoresis, hypertension, fever, tremors, may resemble neuroleptic malignant syndrome (in patients taking SSRIs, SNRIs)
- Assess for tingling, hot sensation, burning, feeling of pressure, numbness, flushing, inj site reaction
- Assess B/P; signs/symptoms of coronary vasospasm
- Monitor stress level, activity, reaction, coping mechanisms of patient
- Assess neurologic status: LOC, blurring vision, nausea, vomiting, tingling in extremities preceding headache
- Assess for ingestion of tyramine-containing foods (pickled products, beer, wine, aged cheese), food additives, preservatives, colorings, artificial sweeteners, chocolate, caffeine, which may precipitate these types of headaches
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, avoid breastfeeding

### Patient/family education

- Caution patient not to take more than 2 doses/day or 12 mg/day; allow at least 1 hr between doses
- Caution patient to avoid driving or hazardous activities if dizziness or drowsiness occurs
- Teach patient to report chest tightness, heat, flushing, drowsiness, dizziness, fatigue, sudden severe abdominal pain or any allergic reactions that occur to prescriber immediately
- Inform patient to report any side effects to prescriber
- Caution patient to use contraception when taking product, to notify prescriber if pregnancy is suspected or planned
- **Nasal spray:** one spray in one nostril, may repeat if headache returns, do not repeat if pain continues after 1st dose

### Evaluation

**Positive therapeutic outcome**

- Decrease in frequency, severity of headache

**⚠ HIGH ALERT**

## SUNItinib (Rx)

(soo-nit'in-ib)

**Sutent**

*Func. class.:* Antineoplastic—miscellaneous

*Chem. class.:* Protein-tyrosine kinase inhibitor

**ACTION:** Inhibits multiple receptor tyrosine kinases (RTKs), some are responsible for tumor growth

**Therapeutic outcome:** Decrease in size of tumor

**USES:** Gastrointestinal stromal tumors (GIST) after disease progression or intolerance to imatinib; advanced renal carcinoma, pancreatic neuroendocrine tumors (pNET) in those with unresectable locally advanced/metastatic disease

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity

**Precautions:** Children, geriatric, active infections, QT prolongation, torsades de pointes, stroke, heart failure

**BLACK BOX WARNING:** Hepatotoxicity

## DOSAGE AND ROUTES

### Gastrointestinal stromal tumors (GIST)/renal cell cancer

**Adult:** PO 50 mg/day × 4 wk, then 2 wk off; may increase or decrease dose by 12.5 mg; if administered with CYP3A4 inducers, give 87.5 mg/day; if given with CYP3A4 inhibitors give 37.5 mg/day

### Pancreatic neuroendocrine (pNET)

**Adult:** PO 37.5 mg/day continuously, increase or decrease by 12.5 mg based on tolerance, avoid potent CYP3A4 inhibitors/inducers, if used with

CYP3A4 inhibitor decrease SUNItinib dose to a minimum of 25 mg/day; if used with CYP3A4 inducer increase SUNItinib to a max of 62.5 mg/day

**Available forms:** Caps 12.5, 25, 37.5, 50 mg

### Implementation

- Give with meal and large glass of water to decrease GI symptoms
- Give nutritious diet with iron, vitamin supplement, low fiber, few dairy products
- Store at 25°C (77°F)

## ADVERSE EFFECTS

**CNS:** CNS hemorrhage, headache, dizziness, insomnia, seizures, fatigue
**CV:** Hypertension, left ventricular dysfunction; QT prolongation, cardiotoxicity, thrombotic microangiopathy, torsades de pointes
**ENDO:** Hyper/hypothyroidism
**GI:** *Nausea,* hepatotoxicity, vomiting, dyspepsia, *anorexia, abdominal pain,* altered taste, *constipation,* stomatitis, mucositis, pancreatitis, diarrhea, GI bleeding/perforation
**GU:** Nephrotic syndrome
**HEMA:** Neutropenia, thrombocytopenia, hemolytic anemia, leukopenia
**INTEG:** *Rash, yellow skin discoloration,* depigmentation of hair or skin, alopecia
**MS:** Pain, arthralgia, myalgia, myopathy, rhabdomyolysis
**RESP:** Cough, dyspnea, pulmonary embolism
**SYST:** Bleeding, electrolyte abnormalities, hand-foot syndrome, serious infection

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 95% |
| **Metabolism** | By CYP3A4 |
| **Excretion** | Feces, small amount in urine |
| **Half-life** | Terminal 40-60 hr (SUNItinib); active metabolite 80-110 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 6-12 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Acetaminophen: increased hepatotoxicity
Bevacizumab: microangiopathic hemolytic anemia; avoid concurrent use
Dexamethasone, carBAMazepine, PHENobarbital, phenytoin, rifampin: decreased SUNItinib concentrations
Haloperidol, chloroquine, droperidol, pentamidine, arsenic trioxide, levomethadyl: increased QT prolongation
Simvastatin: increased plasma concentrations
Warfarin: increased plasma concentration; avoid use with warfarin, use low-molecular-weight anticoagulants instead

### Drug classifications

Calcium channel blockers: increased plasma concentrations
Class IA/III antidysrhythmics, some phenothiazines, β-agonists, local anesthetics, tricyclics, CYP3A4 inhibitors (amiodarone, clarithromycin, erythromycin, telithromycin, troleandomycin), CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone): increased QT prolongation

### Drug/herb

St. John's wort: decreased SUNItinib concentration

### Drug/food

Grapefruit juice: increased plasma concentrations

## NURSING CONSIDERATIONS

### Assessment

- Monitor ANC and platelets; if ANC $<1 \times 10^9$/L and/or platelets $<50 \times 10^9$/L, stop until ANC $>1.5 \times 10^9$/L and platelets $>75 \times 10^9$/L; if ANC $<0.5 \times 10^9$/L and/or platelets $<10 \times 10^9$/L, reduce dose by 200 mg; if cytopenia continues, reduce dose by another 100 mg; if cytopenia continues for 4 wk, stop product until ANC $\geq 1 \times 10^9$/L
- Assess CV status: hypertension, QT prolongation can occur; monitor left ventricular ejection fraction (LVEF) MUGA baseline periodically, ECG, B/P
- **Assess for renal toxicity:** if bilirubin $>3 \times$ IULN, withhold SUNItinib until bilirubin levels return to $<1.5 \times$ IULN; electrolytes
- **Tumor lysis syndrome:** Usually in renal cell carcinoma or GI stromal tumor, may be fatal, monitor for hyperkalemia, severe muscle weakness, hypocalcemia, hyperphosphatemia, myopathy, hyperuricemia, monitor serum electrolytes before each dose
- **Osteoporosis of the jaw:** Dental disease or use of bisphosphonates may increase risk, invasive dental procedures should be avoided
- **QT prolongation:** Those taking CYP3A4 inhibitors, those with bradycardia, cardiac disease, or electrolyte disturbances are at greater risk, monitor electrolytes, especially magnesium, potassium; ECG

S

• Hand-foot syndrome: Assess for redness, swelling, numbness, desquamation on palms and soles of the feet, may occur days after use; if these occur, product should be discontinued
• **Nephrotic syndrome:** Monitor urinalysis and proteinuria

**BLACK BOX WARNING: Hepatotoxicity:** monitor liver function tests, before treatment and qmo; if liver transaminases >5 × IULN, withhold SUNItinib until transaminase levels return to <2.5 × IULN

• Assess for **HF, adrenal insufficiency** in those experiencing trauma
• Assess for bleeding: epistaxis rectal, gingival, upper GI, genital, wound bleeding; tumor-related hemorrhage may occur rapidly
• **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

• Advise patient to report adverse reactions immediately: shortness of breath, bleeding
• Teach patient reason for treatment, expected result
• Teach patient that many adverse reactions may occur: high B/P, bleeding, mouth swelling, taste change, skin discoloration, depigmentation of hair/skin
• Teach patient to avoid persons with known upper respiratory infections; immunosuppression is common
• Teach to avoid grapefruit juice
• Teach patient to report if pregnancy is planned or suspected

### Evaluation

**Positive therapeutic outcome**
• Decrease in size of tumor

## suvorexant

(soo'voe-rex'ant)
**Belsomra**
*Func. class.:* Psychotropic—sedative/hypnotic, anxiolytic
*Chem. class.:* Orexin receptor antagonist
**Controlled Substance Schedule IV**

**ACTION:** Alters the signaling of neurotransmitters called orexins, which are responsible for regulating the sleep–wake cycle

**Therapeutic outcome:** Normalized sleeping patterns

**USES:** The treatment of insomnia characterized by difficulties with sleep onset and/or sleep maintenance

**CONTRAINDICATIONS:** Narcolepsy, hypersensitivity

**Precautions:** Preexisting respiratory disease, COPD, breastfeeding, pregnancy **C,** labor, geriatrics, hepatic disease, sleep apnea, substance abuse, alcohol use, suicidal ideation, mental changes, depression

## DOSAGE AND ROUTES

**Adult: PO** 10 mg every night within 30 min of going to bed, and with ≥7 hr remaining before the planned time of awakening, may increase to maximum 20 mg every night

**Available forms:** Tabs 5, 10, 15, 20 mg

### Implementation

• Give 30 min before bedtime
• Effect may be delayed if taken with food, take on empty stomach for faster effect

## ADVERSE EFFECTS

**CNS:** Amnesia, suicidal ideation, anxiety, dizziness, drowsiness, hallucinations, headache, memory impairment, sleep paralysis
**GI:** Diarrhea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | High-protein binding |
| **Metabolism** | Unknown |
| **Excretion** | Feces (66%), urine (23%) |
| **Half-life** | Terminal half-life 12 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

CNS depressants: increased effects of both products
CYP3A inducers: decreased suvorexant effect
CYP3A inhibitors: avoid concurrent use

### Drug/herb

Kava kava, melatonin, valerian: increased suvorexant effect

## NURSING CONSIDERATIONS

### Assessment

• Sleeping patterns: waking in the night, inability to fall asleep, stay asleep, amnesia
• Teach patient to notify provider if pregnancy is planned or suspected, or if breastfeeding
• Teach patient that complex sleep behaviors may occur (sleep driving, sleep eating)

• Teach patient that daytime drowsiness or dizziness may occur, to avoid hazardous activities until response is known
• Teach patient to avoid grapefruit juice
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excretion unknown
• **Beers:** Avoid in older adults with or at high risk for delirium

## Patient/family education

• Advise patient to use on an empty stomach for faster effect
• Teach patient to report suicidal thoughts/behaviors immediately or if depression worsens
• Teach patient to avoid use with other products unless approved by prescriber

## Evaluation

### Therapeutic response

• Normalized sleeping patterns

salicylic acid topical
saxagliptin (Rx)
selegiline (Rx)
sildenafil (Rx)
silver nitrate 1% ophthalmic
simethicone (Rx, OTC)
sitaGLIPtin (Rx)
sodium polystyrene sulfonate (Rx)
solifenacin (Rx)
sotalol (Rx)
succinylcholine (Rx)
sulfaSALAzine (Rx)
suvorexant
salmeterol (Rx)
scopolamine (Rx)
selenium topical
silodosin (Rx)
silver nitrate sulfacetamide sodium ophthalmic
simvastatin (Rx)
sodium bicarbonate (Rx, OTC)
sofosbuvir
somatropin (Rx)
spironolactone (Rx)
sucralfate (Rx)
SUMAtriptan (Rx)
sargramostim (Rx)
secukinumab (Rx)
sertraline (Rx)
simeprevir
silver sulfADIAZINE topical
sirolimus (Rx)
sodium biphosphate/sodium phosphate (OTC)
sofosbuvir/velpatasvir
sonidegib
stavudine d4t (Rx)
sulfamethoxazole/trimethoprim (cotrimoxazole) (Rx)
SUNItinib (Rx)

## tacrolimus (PO, IV) (Rx)

(tak-row'lim-us)

**Astagraf XL, Prograf**

## tacrolimus (topical) (Rx)

**Protopic**

*Func. class.:* Immunosuppressant

*Chem. class.:* Macrolide

**Do not confuse:** Prograf/PROzac

**ACTION:** Produces immunosuppression by inhibiting lymphocytes (T)

**Therapeutic outcome:** Prevention of rejection in organ transplant

**USES:** Organ transplants, to prevent rejection; **topical:** atopic dermatitis

**Unlabeled uses:** Severe recalcitrant psoriasis graft-versus-host disease

## CONTRAINDICATIONS

Hypersensitivity to this product or to some kinds of castor oil, long-term use (topical), child <2 yr (topical)

**Precautions:** Pregnancy, breastfeeding, children <12 yr, severe renal/hepatic disease, diabetes mellitus, hyperkalemia, hyperuricemia, lymphomas, hypertension, acute bronchospasm, African descent, heart failure, seizures, QT prolongation

**BLACK BOX WARNING:** Children <12 yr, lymphomas, infection, neoplastic disease, neonates, infants; requires a specialized setting and an experienced clinician; liver transplant (ext rel)

## DOSAGE AND ROUTES-NTI

### Kidney transplant rejection prophylaxis

**Adult:** **IV** 0.03-0.05 mg/kg/day as cont INF, give no sooner than 6 hr after transplantation

### Liver transplant rejection prophylaxis

**Adult:** PO 0.1-0.15 mg/kg/day in 2 divided doses q12h, give no sooner than 6 hr after transplantation; **IV** 0.03-0.05 mg/kg/day as a cont INF, give no sooner than 6 hr after transplantation; ext rel caps 0.1 mg/kg qday preoperatively on empty stomach, 1st dose 12 hr prior to reperfusion and 0.2 mg/kg once daily postoperatively 1st dose within 12 hr of reperfusion but ≥ 4 hr after preoperative dose in combination with mycophenolate and corticosteroids

### Heart transplant rejection prophylaxis

**Adult:** PO 0.075 mg/kg/day in 2 divided doses q12h, give no sooner than 6 hr after transplantation; **IV** 0.01 mg/kg/day as a cont INF, give no sooner than 6 hr after transplantation

### Atopic dermatitis

**Adult:** TOP use 0.03% or 0.1% ointment, apply bid × 7 day after clearing of signs

**Child 2-5 yr:** TOP 0.03% ointment, apply bid × 7 day after clearing of signs

**Available forms:** Inj **IV** 5 mg/ml; caps 0.5, 1, 5 mg; ext rel cap 0.5, 1, 5 mg; ointment 0.03%, 0.1%

### Implementation

**Conventional immediate-release capsules**

- Give consistently with or without food

**Extended-release capsules (Astagraf XL)**

- Take in the morning, preferably on an empty stomach, at least 1 hr before a meal or at least 2 hr after a meal
- Swallow whole; do not chew, divide, or crush capsules
- Do not administer with an alcoholic beverage
- If a dose is missed up to 14 hr from the scheduled time, take the dose. If a dose is missed at more than 14 hr from the scheduled time, skip the dose and take the next dose at the regularly scheduled time

**Extended-release tablets (Envarsus XR)**

- Take in the morning, preferably on an empty stomach, at least 1 hr before a meal or at least 2 hr after a meal
- Swallow whole; do not chew, divide, or crush capsules
- Do not administer with an alcoholic beverage
- If a dose is missed up to 15 hr from the scheduled time, take the dose. If a dose is missed at more than 15 hr from the scheduled time, skip the dose and take the next dose at the regularly scheduled time
- Topical ointment has risk of developing cancer; use only when other options have failed

**IV route**

- Visually inspect for particulate matter and discoloration before use
- Because of the risk of hypersensitivity reactions, IV use should be reserved for those who cannot take tacrolimus orally. Oral therapy should replace IV therapy as soon as possible
- Observe patients for 30 min after beginning the infusion and frequently thereafter for possible hypersensitivity reactions

• Due to chemical instability, tacrolimus should not be mixed or infused with solutions with a pH of 9 or more (acyclovir or ganciclovir)

**Dilution**

• The concentrate for injection must be diluted with NS or D5W injection to a final concentration between 0.004 mg/ml and 0.02 mg/ml
• Prepare solutions in polyethylene or glass containers to allow storage for 24 hr, do not use polyvinyl chloride (PVC) containers because stability is decreased and the polyoxyl 60 hydrogenated castor oil in the formulation may leach phthalates from PVC containers

**Continuous IV infusion**

• Give through non-PVC tubing to minimize the potential for drug adsorption onto the tubing
• Infuse the required daily dose of the diluted IV solution over 24 hr

**Y-site compatibilities:** Alemtuzumab, alfentanil, amifostine, amikacin, aminophylline, amiodarone, amphotericin B colloidal, amphotericin B liposome, anidulafungin, atracurium, aztreonam, benztropine, bivalirudin, bleomycin, bumetanide, buprenorphine, busulfan, butorphanol, calcium acetate/chloride/gluconate, CARBOplatin, carmustine, caspofungin, ceFAZolin, cefoperazone, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, dexrazoxane, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doripenem, doxacurium, DOXOrubicin hydrochloride, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, foscarnet, fosphenytoin, gemcitabine, gentamicin, glycopyrrolate, granisetron, haloperidol, heparin, hydrALAZINE, hydrocortisone, HYDROmorphone, IDArubicin, ifosfamide, imipenem/cilastatin, inamrinone, insulin, isoproterenol, ketorolac, labetalol, leucovorin, levofloxacin, levorphanol, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, meperidine, meropenem, mesna, metaraminol, methotrexate, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, micafungin, midazolam, milrinone, mitoMYcin, mitoXANtrone, mivacurium, morphine, multivitamins, nafcillin, nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pancuronium, PEMEtrexed, penicillin G, pentamidine, pentazocine, perphenazine, phentolamine, phenylephrine, piperacillin/tazobactam, potassium chloride/phosphates, procainamide, prochlorperazine, promethazine, propranolol, quinupristin/dalfopristin, ranitidine, remifentanil, rocuronium, sodium acetate/bicarbonate/phosphates, streptozocin, succinylcholine, SUFentanil, teniposide, theophylline, thiotepa, ticarcillin/clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, trimethobenzamide, vancomycin, vasopressin, vecuronium, verapamil, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

**Y-site incompatibilities:** Acyclovir, allopurinol, azaTHIOprine, cefepime, dantrolene, diazepam, diazoxide, espmeprazole, folic acid, ganciclovir, iron sucrose, levothyroxine, omeprazole, phenytoin, thiopental

## ADVERSE EFFECTS

**CNS:** *Tremors, headache,* insomnia, paresthesia, chills, fever, seizures, posterior reversible encephalopathy syndrome, BK-virus-associated nephropathy, coma, posterior reversible encephalopathy syndrome (PRES)
**CV:** Hypertension, myocardial hypertrophy, prolonged QTc, cardiomyopathy
**EENT:** Blurred vision, photophobia
**GI:** Nausea, vomiting, diarrhea, constipation, GI bleeding, GI preforation
**GU:** Urinary tract infections, albuminuria, hematuria, proteinuria, renal failure, hemolytic uremic syndrome
**HEMA:** Anemia, leukocytosis, thrombocytopenia, purpura
**INTEG:** Rash, flushing, itching, alopecia
**META:** Hyperglycemia, hyperuricemia, hypokalemia, hyperkalemia
**MS:** Back pain, muscle spasms
**RESP:** Pleural effusion, atelectasis, dyspnea, interstitial lung disease
**SYST:** Anaphylaxis, infection, malignancy

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Erratically absorbed (PO), completely absorbed (**IV**) |
| **Distribution** | Crosses placenta, 75% protein binding |
| **Metabolism** | Liver to metabolite |
| **Excretion** | Kidney—minimal; breast milk, bile |
| **Half-life** | 10 hr |

T

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | Unknown | Unknown |
| **Peak** | 1-4 hr | Unknown |
| **Duration** | 12 hr | 12 hr |

## INTERACTIONS

### Individual drugs

CarBAMazepine, PHENobarbital, phenytoin, rifamycin: decreased blood levels
Cimetidine, danazol, erythromycin, mycophenolate, mofetil: increased blood levels
CISplatin, cycloSPORINE: increased toxicity
Haloperidol, chloroquine, droperidol, pentamidine, arsenic trioxide, CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone): increased QT prolongation; do not use together
Ibuprofen: increased oliguria

### Drug classifications

Aminoglycosides: increased toxicity
Antifungals, calcium channel blockers: increased blood levels
Class IA/III antidysrhythmics, some phenothiazines, β-agonists, local anesthetics, tricyclics, CYP3A4 inhibitors (amiodarone, clarithromycin, erythromycin, telithromycin, troleandomycin), CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone): increased QT prolongation
Live virus vaccines: decreased effect of vaccines

### Drug/herb

Astragalus, echinacea, melatonin: decreased immunosuppression, ginseng, St. John's wort

### Drug/food

Decreased absorption of food
Grapefruit juice: increased effect of tacrolimus

### Drug/lab test

Increased: glucose, BUN, creatinine
Decreased: magnesium, Hgb, platelets
Increased or decreased: LFTs, potassium

## NURSING CONSIDERATIONS

### Assessment

- Assess for caster oil allergy (HCO-60) do not use if present
- **Monitor blood studies:** Hgb, WBC, platelets during treatment monthly; if WBC is $<3000/mm^3$ or platelet count $<100,000/mm^3$, product should be discontinued or reduced; decreased Hgb level may indicate bone marrow suppression
- **QT prolongation:** ECG for QT prolongation, ejection fraction; assess for chest pain, palpitations, dyspnea
- **Monitor liver function tests:** alkaline phosphatase, AST, ALT, amylase, bilirubin, and for hepatotoxicity: dark urine, jaundice, itching, light-colored stools; product should be discontinued
- Monitor serum creatinine/BUN, serum electrolytes, lipid profile, serum tacrolimus concentration
- **Assess for anaphylaxis:** rash, pruritus, wheezing, laryngeal edema; stop inf, initiate emergency procedures
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed, excretion unknown

### Patient/family education

**BLACK BOX WARNING:** Advise patient to report if pregnancy is planned or suspected

**BLACK BOX WARNING:** Advise patient to report symptoms of lymphoma, or skin cancer

- Instruct patient to report fever, rash, severe diarrhea, chills, sore throat, fatigue because serious infections may occur; clay-colored stools, cramping may indicate hepatotoxicity, signs of diabetes mellitus
- Caution patient to avoid crowds or persons with known infections to reduce risk of infection, to avoid eating raw shellfish

**BLACK BOX WARNING: Liver transplant:** extended-release product should not be used due to increased female death rate

**BLACK BOX WARNING: Specialized care setting, experienced clinician:** this product should only be used when equipped and staffed with adequate supportive medical services and by those experienced in immunosuppressive therapy and organ transplantation

**BLACK BOX WARNING: Children, infants, neonates**: Not approved use of ointment in those <2 yr old, ext rel in those <16 yr not approved for pediatric kidney/heart transplant

### Topical:

- Teach patient to stop using topical product when atopic dermatitis is resolved, not to use over 6 wk if symptoms do not improve, not to shower or swim after applying
- Teach patient not to consume grapefruit juice

### Evaluation

**Positive therapeutic outcome**
- Absence of graft rejection
- Immunosuppression in autoimmune disorders

## tadalafil (Rx)

(tah-dal'a-fil)
**Adcirca, Cialis**
*Func. class.:* Impotence agent
*Chem. class.:* Phosphodiesterase type 5 inhibitor

**ACTION:** Inhibits phosphodiesterase type 5 (PDE5); enhances erectile function by increasing the amount of cyclic GMP, which causes smooth muscle relaxation and increased blood flow into the corpus cavernosum; improves erectile function for up to 36 hr

**Therapeutic outcome:** Erection

**USES:** Treatment of erectile dysfunction; pulmonary arterial hypertension (PAH) (Adcirca only), benign prostatic hyperplasia (BPH) with or without erectile dysfunction

## CONTRAINDICATIONS

Newborns, women, children, hypersensitivity, patients taking organic nitrates regularly or intermittently, patients taking any α-adrenergic antagonist other than 0.4 mg once-daily tamsulosin

**Precautions:** Pregnancy, anatomic penile deformities, sickle cell anemia, leukemia, multiple myeloma, CV/renal/hepatic disease, bleeding disorders, active peptic ulcer, prolonged erection

## DOSAGE AND ROUTES

### Erectile dysfunction

**Adult:** PO (Cialis) CCr 51-80 ml/min erectile dysfunction no adjustment; 20 mg/day initially, pulmonary hypertension; 10 mg, taken prior to sexual activity, dose may be reduced to 5 mg or increased to a max of 20 mg; usual max dosing frequency is once per day; once-daily dosing 2.5 mg/day at same time each day

### For improvement in exercise ability in patients with WHO Group I pulmonary hypertension (Adcirca)

**Adult:** PO 40 mg (two 20-mg tablets) qday with or without food

### BPH

**Adult:** PO 5 mg bid at the same time every day

### Renal dose

**Adult:** PO CCr 31-50 ml/min 5 mg/day, max 10 mg q48hr; CCr <30 ml/min, max 5 mg q72hr

### Hepatic dose

**Adult:** PO Child-Pugh class A, B, max 10 mg/day or 20 mg/day (pulmonary hypertension) max 40 mg/day; Child-Pugh class C, not recommended

### Concomitant medications

Ketoconazole, itraconazole, ritonavir, max 10 mg q72hr

**Available forms:** Tabs (Cialis) 2.5, 5, 10, 20 mg; tab 20 mg (Adcirca)

### Implementation

- **Sexual dysfunction:** give before sexual activity; do not use more than once a day
- **Pulmonary hypertension:** give Adcirca without regard to meals
- Product should not be used with nitrates in any form

## ADVERSE EFFECTS

**CNS:** *Headache, flushing, dizziness,* seizures, transient global amnesia
**CV:** MI, hypotension, QT prolongation
**INTEG:** Stevens-Johnson syndrome, exfoliative dermatitis, urticaria
**MISC:** Back pain/myalgia, *dyspepsia, nasal congestion, UTI,* blurred vision, changes in color vision, *diarrhea,* pruritus, priapism, nonarteritic ischemic optic neuropathy (NAION), hearing loss

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid; rate and extent of absorption of tadalafil are not influenced by food |
| **Distribution** | 94% protein bound |
| **Metabolism** | Liver |
| **Excretion** | Excreted primarily as metabolites, feces, urine; plasma concentration 61% in feces, 36% in urine |
| **Half-life** | 17.5 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | 6 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol, amlodipine, enalapril: decreased B/P
Bosentan: decreased effects of tadalafil
Itraconazole, ketoconazole, ritonavir: increased levels (although not studied, may also include other HIV protease inhibitors)

T

### Drug classifications

• Do not use with nitrates because of unsafe drop in B/P that could result in heart attack or stroke
α-blockers, angiotensin II receptor blockers: decreased B/P
Antacids: decreased effects of tadalafil

### Drug/food

Grapefruit: increased tadalafil effect

## NURSING CONSIDERATIONS

### Assessment

• **Cialis:** assess for underlying cause of erectile dysfunction prior to treatment; organic nitrates that should not be used with this product; assess for severe loss of vision
• **Adcirca:** monitor hemodynamic parameters baseline and periodically
• **Pregnancy/breastfeeding:** Use only if clearly needed (Adcirca only). Cialis is not indicated for women, cautious use in breastfeeding
• **Beers:** Use with caution in older adults, may exacerbate syncope, monitor frequently for syncope
• Teach patient to notify provider immediately and to stop taking product if vision, hearing loss occurs

### Patient/family education

• Teach patient to take 1 hr before sexual activity
• Teach patient not to drink large amounts of alcohol
• Advise that product does not protect against STDs, including HIV
• Instruct to tell physician if patient has a bleeding problem
• Advise that product should not be used with nitrates in any form
• Advise that product has no effect in the absence of sexual stimulation
• Instruct to seek medical help if an erection lasts more than 4 hr or if chest pain occurs
• Advise to notify physician of all medicines, vitamins, and herbs patient is taking, especially α-blockers, erythromycin, indinavir, itraconazole, ketoconazole, nitrates, ritonavir
• Advise that tadalafil is contraindicated for use with α-blockers except 0.4 mg/daily tamsulosin

### Evaluation

#### Positive therapeutic outcome

• Sustainable erection
• Improvement in exercise ability (pulmonary hypertension)

**⚠ HIGH ALERT**

## tamoxifen (Rx)

(ta-mox'i-fen)
**Apo-Tamox, Soltamox, Tamofen, Tamone, Tamoplex**
*Func. class.:* Antineoplastic
*Chem. class.:* Antiestrogen

**ACTION:** Inhibits cell division by binding to cytoplasmic estrogen receptors; resembles normal cell complex but inhibits DNA synthesis and estrogen response of target tissue

**Therapeutic outcome:** Prevention of rapidly growing malignant cancer

**USES:** Advanced breast carcinoma that has not responded to other therapy in estrogen receptor–positive patients (usually postmenopausal), prevention of breast cancer, after breast surgery/radiation in ductal carcinoma in situ (DCIS)

**Unlabeled uses:** Mastalgia, pain/size of gynecomastia, ovulation stimulation, malignant carcinoid tumor, carcinoid syndrome, metaplastic melanoma, desmoid tumors, McCune-Albright syndrome (female pediatric patients)

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity

**BLACK BOX WARNING:** Thromboembolic disease, endometrial cancer, stroke

**Precautions:** Leukopenia, thrombocytopenia, cataracts, women of childbearing age

**BLACK BOX WARNING:** Uterine cancer

## DOSAGE AND ROUTES

### Breast cancer (men/women)

**Adult:** PO 20-40 mg/day × 5 yr, doses >20 mg/day divide AM/PM

### High risk for breast cancer

**Adult:** PO 20 mg/day × 5 yr

### Ductal carcinoma in situ

**Adult:** PO 20 mg/day × 5 yr

**Available forms:** Tabs 10, 20 mg; oral solution 10 mg/5 ml

### Implementation

• Do not break, crush, or chew tabs
• Give with food or fluids for GI upset; repeat dose may be needed if vomiting occurs
• Store in light-resistant container at room temperature
• Oral solution: use calibrated container; dose >20 mg/day should be divided morning and

evening; may be used with food for gastric irritation

## ADVERSE EFFECTS

**CNS:** *Hot flashes, headache, light-headedness,* depression, mood changes
**CV:** Chest pain, stroke, fluid retention, flushing
**EENT:** Ocular lesions, cataracts, retinopathy, corneal opacity, blurred vision (high doses)
**GI:** *Nausea, vomiting,* altered taste (anorexia)
**GU:** Vaginal bleeding, pruritus vulvae, uterine malignancies, *altered menses, amenorrhea*
**HEMA:** Thrombocytopenia, leukopenia, deep vein thrombosis
**INTEG:** *Rash,* alopecia
**META:** Hypercalcemia
**RESP:** Pulmonary embolism

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Adequately absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Liver—extensively |
| **Excretion** | Feces—slowly, small amounts (kidneys) |
| **Half-life** | 1 wk |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 4-7 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Aminoglutethimide, rifamycin: decreased tamoxifen levels
Bromocriptine: increased tamoxifen level
Letrozole: decreased levels of letrozole
PARoxetine: increased risk for death from breast cancer
Radiation: increased myelosuppression

### Drug classifications

Anticoagulants: increased risk of bleeding
Cytotoxics: increased thromboembolic action
CYP2D6 inhibitors (antidepressants): decreased tamoxifen effect
CYP3A4 inducers (barbiturates, bosentan, carBAMazepine, efavirenz, phenytoin, nevirapine, rifabutin, rifampin): decreased tamoxifen effect
CYP3A4 inhibitors (aprepitant, antiretroviral protease inhibitors, clarithromycin, danazol, delavirdine, diltiazem, erythromycin, fluconazole, FLUoxetine, fluvoxaMINE, imatinib, ketoconazole, mibefradil, nefazodone, telithromycin, voriconazole): increased toxicity

### Drug/herb

Black cohosh, dong quai, St. John's wort: avoid use

### Drug/lab test

Increased: serum calcium, $T_4$, AST, ALT, cholesterol, triglycerides, BUN

## NURSING CONSIDERATIONS

### Assessment

- Monitor CBC, differential, platelet count weekly; withhold product if WBC is $<4000/mm^3$ or platelet count is $<75{,}000/mm^3$; notify prescriber of results; monitor calcium levels (hypercalcemia is common); breast exam, mammogram, pregnancy test, bone mineral density, LFTs, serum calcium, serum lipid profile, periodic eye exams (cataracts, retinopathy)
- **Assess for tumor flare:** increase in bone, tumor pain during beginning treatment; give analgesics as ordered to decrease pain
- **Assess for bleeding:** hematuria, guaiac, bruising or petechiae, mucosa or orifices q8hr, no rectal temp
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding
- **Severe allergic reactions:** Rash, pruritus, urticaria, purpuric skin lesions, itching, flushing
- Bone pain; May give analgesics; pain usually transient

**BLACK BOX WARNING: Assess for uterine malignancies:** symptoms of stroke, PE that may occur in women with DCIS and women at high risk for breast cancer, monitor gynecologic exams periodically

### Patient/family education

- Teach patient to use nonhormonal contraception during treatment and for 2 months after discontinuing treatment
- **Teach patient to notify prescriber of stroke:** blurred vision, headache, weakness on one side of the body; pulmonary embolism: chest pain, fainting sweating, difficulty breathing
- Instruct patient to report any complaints, side effects to prescriber; if dose is missed, do not double next dose; that use may be 5 yr
- Advise patient that vaginal bleeding, pruritus, hot flashes can occur and are reversible after discontinuing treatment
- Instruct patient to report immediately decreased visual acuity, which may be irreversible; stress need for routine eye exams
- Inform patient about who should be told about tamoxifen therapy

T

- Advise patient to report vaginal bleeding immediately; that tumor flare (increase in size or tumor, increased bone pain) may occur and will subside rapidly; may take analgesics for pain; that premenopausal women must use mechanical birth control method because ovulation may be induced (teratogenic product)
- **Tumor flare:** Advise patient that increase in size of tumor, increased bone pain may occur and will subside rapidly; may take analgesics for pain
- Teach patient that hair loss may occur during treatment; a wig or hairpiece may make patient feel better; new hair may be different in color, texture
- Advise patient to increase fluids to 2 L/day unless contraindicated

### Evaluation

**Positive therapeutic outcome**
- Decreased spread of malignant cells in breast cancer

## tamsulosin (Rx)

(tam-sue-lo'sen)
**Flomax**
*Func. class.:* Selective α-adrenergic blocker, BPH agent
*Chem. class.:* Sulfamoyl phenethylamine derivative

**Do not confuse:** Flomax/Fosamax/Volmax

**ACTION:** Binds preferentially to α IA-adrenoceptor subtype located mainly in the prostate

**Therapeutic outcome:** Decreased symptoms of benign prostatic hyperplasia (BPH)

**USES:** Symptoms of BPH

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, hepatic disease, CAD, severe renal disease, prostate cancer; cataract surgery (floppy iris syndrome)

## DOSAGE AND ROUTES

**Adult:** PO 0.4 mg/day, increasing to 0.8 mg/day if required

### Hepatic dose (moderate impairment)

**Adult:** PO reg rel 50 mg q8hr, titrate; ext rel 50 mg q24hr, titrate, max 100 mg q24hr; avoid use in severe impairment

**Available forms:** Caps 0.4 mg

### Implementation

- Swallow caps whole; do not break, crush, or chew
- Store in airtight container at 86° F (30° C) or less
- Give without regard to food, but may be given with food to prevent GI symptoms; ½ hr after same meal each day
- If treatment is interrupted for several days, restart at lowest dose (0.4 mg/day)

## ADVERSE EFFECTS

**CNS:** *Dizziness, headache,* asthenia, insomnia
**CV:** Chest pain, orthostatic hypotension
**EENT:** Amblyopia, floppy iris syndrome
**GI:** Nausea, diarrhea, dysgeusia
**GU:** Decreased libido, abnormal ejaculation, priapism
**MS:** Back pain
**RESP:** Rhinitis, pharyngitis, cough
**SYST:** Angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Not known; 98% plasma protein bound |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys |
| **Half-life** | 9-15 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Cimetidine: increased toxicity
Doxazosin, prazosin, terazosin, vardenafil: do not use together

### Drug classifications

α-blockers: do not use together

### Drug/food

Decreased: absorption with food

## NURSING CONSIDERATIONS

### Assessment

- Monitor CBC with differential and liver function tests; B/P and heart rate
- Monitor urodynamic studies/urinary flow rates, residual volume
- **Assess for BPH:** change in urinary patterns, baseline, throughout treatment; monitor I&O ratios, weight daily, edema, report weight gain or edema
- **Orthostatic hypotension:** monitor B/P standing, sitting
- **Pregnancy/breastfeeding:** Not to be used for women

### Patient/family education

- Teach patient not to discontinue product abruptly; emphasize the importance of complying with dosage schedule, even if feeling better; if dose is missed take as soon as remembered; take at same time each day
- Teach patient not to use OTC products (cough, cold, allergy) unless directed by prescriber; also to avoid large amounts of caffeine
- Caution patient that product may cause dizziness, may occur during 1st few days of therapy; to avoid hazardous activities
- Teach patient to take ½ hr after same meal each day
- Teach patient about priapism (rare)
- Advise patient not to crush, break, chew caps
- Teach patient that decreased ejaculate or absence may occur, resolves after discontinuing

### Evaluation

**Positive therapeutic outcome**

- Decreased symptoms of BPH

**⚠ HIGH ALERT**

## tapentadol (Rx)

(ta-pen'ta-dol)

**Nucynta, Nucynta IR 🍁, Nucynta ER**

Func. class.: Analgesic, miscellaneous

*Chem. class.:* μ-Opioid receptor agonist

**Controlled substance schedule II**

**ACTION:** Centrally acting synthetic analgesic; μ-opioid agonist activity is thought to result in analgesia; inhibits norepinephrine uptake

**Therapeutic outcome:** Relief of pain

**USES:** Moderate to severe pain

## CONTRAINDICATIONS

Hypersensitivity, asthma, ileus

**BLACK BOX WARNING:** Respiratory depression

**Precautions:** Pregnancy, breastfeeding, children <18 yr, increased intracranial pressure, MI (acute), severe heart disease, respiratory depression, renal/hepatic disease, GI obstruction, ulcerative colitis, sleep apnea, seizure disorder

**BLACK BOX WARNING:** Accidental exposure, avoid ethanol, substance abuse, neonatal opioid withdrawal/syndrome, potential for overdose, poisoning, coadministration with other CNS depressants

## DOSAGE AND ROUTES

**Adult:** PO 50-100 mg q4-6hr; may give second dose 1 hr or more after 1st dose; max 700 mg on day 1, 600 mg/day thereafter; ext rel 50 mg q12hr (opioid-naive), titrate to 100-250 mg q12hr, max 250 mg q12hr

### Hepatic disease

**Adult:** PO immediate rel sol 50 mg q8hr; may titrate to response; ext rel 50 mg qday max 100 mg/day

**Available forms:** Tab 50, 75, 100 mg; tabs, ext rel 50, 100, 150, 200, 250 mg

### Implementation

- Give with antiemetic if nausea, vomiting occur
- Give when pain is beginning to return; determine dosing interval by response
- Store in light-resistant area at room temperature
- Provide assistance with ambulation
- Provide safety measures: night-light, call bell within easy reach
- Not to crush, chew, break, or use with alcohol: ext rel product
- This is the preferred analgesic in those with altered cytochrome P450 or mild hepatic disease, mild to moderate renal disease

**BLACK BOX WARNING:** These products have high potential for overdose, poisoning; may be fatal due to respiratory depression

## ADVERSE EFFECTS

**CNS:** *Drowsiness, dizziness, confusion, headache, euphoria,* hallucinations, restlessness, syncope, anxiety, flushing, psychological dependence, insomnia, lethargy, tremor, seizures
**CV:** Palpitations, bradycardia, hypo/hypertension, orthostatic hypotension, sinus tachycardia
**GI:** *Nausea, vomiting, anorexia, constipation, cramps,* gastritis, dyspepsia, biliary spasms
**GU:** Urinary retention/frequency
**INTEG:** *Rash,* urticaria, diaphoresis, pruritus
**RESP:** Respiratory depression, cough
**SYST:** Anaphylaxis, infection, serotonin syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 32% |
| **Distribution** | Protein binding 20% |
| **Metabolism** | Liver, extensively |
| **Excretion** | Urine 99% |
| **Half-life** | Terminal 4 hr |

T

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

**BLACK BOX WARNING:** Alcohol: increased effects with other CNS depressants

### Drug classifications

Antipsychotics, opioids, sedatives/hypnotics, skeletal muscle relaxants: increased effects with other CNS depressants

MAOIs: increased toxicity

Serotonin-receptor agonists, SSRIs, SNRIs, tricyclics: increased serotonin syndrome

**Black Box Warning:** Do not use with alcohol; fatal overdose may occur

### Drug/herb

Kava, St. John's wort, valerian: increased sedative effect

## NURSING CONSIDERATIONS

### Assessment

- Monitor I&O ratio; check for decreasing output; may indicate urinary retention
- Assess CNS changes: dizziness, drowsiness, hallucinations, euphoria, LOC, pupil reaction
- Assess for allergic reactions: rash, urticaria, anaphylaxis
- **Seizures:** History of seizures, increased with SSRIs, SNRIs, tricyclic antidepressants
- **Serotonin syndrome:** Assess for increased heart rate, shivering, sweating, dilated pupils, tremors, high B/P, hyperthermia, headache, confusion; if these occur, stop product, administer a serotonin antagonist if needed

**BLACK BOX WARNING: Addiction risk, previous substance abuse** before using extended-release product, some may crush extended-release product and snort, inject product that is dissolved

**BLACK BOX WARNING: Accidental exposure:** Identify if alcohol has been used before giving this product; may be fatal if used with tapentadol, keep from children, pets, avoid coadministration with other CNS depressants

**BLACK BOX WARNING: Assess for respiratory dysfunction:** respiratory depression, character, rate, rhythm; notify prescriber if respirations are <10/min; also B/P, pulse

- **Assess for pain:** intensity, location, type, characteristics; need for pain medication by pain/sedation scoring; physical dependence

**BLACK BOX WARNING:** Neonatal opioid withdrawal syndrome: May be fatal, monitor neonates for irritability, hyperactivity, abnormal sleep patterns, high-pitched cry, tremors, vomiting, diarrhea, failure to gain weight

**BLACK BOX WARNING:** Pregnancy/breastfeeding: Use only if benefits outweigh fetal risk, including neonatal opioid withdrawal syndrome, do not breastfeed, excretion unknown

### Patient/family education

- Teach patient to report any symptoms of CNS changes, allergic reactions
- Advise that physical dependency may result from extended use
- Inform that withdrawal symptoms may occur: nausea, vomiting, cramps, fever, faintness, anorexia
- Teach to avoid CNS depressants, alcohol
- Advise to avoid driving, operating machinery if drowsiness occurs

**BLACK BOX WARNING:** Not to use with alcohol, may be fatal

### Evaluation

**Positive therapeutic outcome**

- Decrease in pain

## RARELY USED

## tasimelteon

(tas'i-mel'tee-on)

**Hetlioz**

*Func. class.:* Anxiolytic/sedative/hypnotic

**USES:** Sleep-wake disorder in the blind

**CONTRAINDICATIONS:** Hypersensitivity

## DOSAGE AND ROUTES

**Adult: PO** 20 mg before bedtime at the same time every night; take without food

## tavaborole topical

*See Appendix B*

## tazobactam

*See piperacillin/tazobactam*

**RARELY USED**

## teduglutide

(te′due-gloo′tide)

**Gattex**

*Func. class.:* GI disorder agent

*Chem. class.:* Recombinant glucagonlike peptide-2 analog

**ACTION:** Increases intestinal, portal blood flow, inhibits gastric acid secretion, decreases gastric motility

**Therapeutic outcome:** Increased absorption of nutrients

**USES:** Short bowel syndrome in patients who are dependent on parenteral support

**Precautions:** Pregnancy, breastfeeding, diarrhea, pancreatitis, renal disease, electrolyte imbalances, GI obstruction, heart failure, neoplastic disease, biliary tract disease, cardiac disease, gastric cancer, GI disease

## DOSAGE AND ROUTES

**Adult:** SUBCUT 0.05 mg/kg/day

**Available forms:** Powder for injection 5 mg

### Implementation

**SUBCUT route**

• ***Reconstitution:*** Slowly inject the 0.5 ml of preservative-free sterile water for injection provided in the prefilled syringe into the vial; allow to stand for 30 sec and gently roll the vial between your palms for 15 sec; do not shake; allow to stand 2 min; if undissolved powder is present, roll the vial again until all material is dissolved; if the product remains undissolved after the second attempt, do not use; discard unused portion; use within 3 hr after reconstitution

**SUBCUT injection**

• Calculate dose, withdraw into a syringe, and give; do not use IV, IM; if a dose is missed, it should be given as soon as possible on the same day; two doses should not be given on the same day; alternate sites

## ADVERSE EFFECTS

**CNS:** Headache, fatigue

**GI:** Nausea, abdominal pain, cholecystitis, cholestasis, GI obstruction, pancreatitis, vomiting

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 2 hr; 1.3 hr (short bowel syndrome) |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Benzodiazepine, carBAMazepine, cycloSPORINE, digoxin, disopyramide, ethosuximide, flecainide, lerothyromixe, lithium, phenytoin, procainamide, quiNIDine, sirolimus, tacrolimus, theophylline, valproic acid, warfarin: increased absorption of each of these products

## NURSING CONSIDERATIONS

### Assessment

• GI symptoms: nausea, abdominal pain

• Monitor alk phos, amylase, bilirubin, serum electrolytes, lipase—baseline and q6mo

### Patient/family education

• Instruct patient to notify prescriber of GI symptoms

### Evaluation

**Positive therapeutic outcome**

• Increased absorption of nutrients

## telavancin (Rx)

(tel-a-van′sin)

**Vibativ**

*Func. class.:* Antiinfective—miscellaneous

*Chem. class.:* Lipoglycopeptide

**ACTION:** Inhibits bacterial cell wall synthesis, disrupts cell membrane integrity, blocks glycopeptides

**Therapeutic outcome:** Negative culture

**USES:** Skin/skin structure infections caused by *Enterococcus faecalis, E. faecium, Staphylococcus aureus* (MSRA), *S. aureus* (MSSA), *S. epidermidis, S. haemolyticus, Streptococcus agalactiae* (group B), *S. dysgalactiae, S. pyogenes* (group A beta tremolytic), *S. anginosus, S. intermedius, S. constellatus,* nosocomial pneumonia caused by susceptible gram-positive bacteria

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Breastfeeding, geriatric patients, renal disease, antimicrobial resistance, children, diabetes mellitus, diarrhea, GI disease, heart failure, hypertension, pseudomembranous colitis, QT prolongation, vancomycin hypersensitivity

T

**BLACK BOX WARNING:** Pregnancy, females, renal disease

## DOSAGE AND ROUTES

### Complicated skin/skin structure infections

**Adult: IV** INF 10 mg/kg over 60 min q24hr × 7-14 days

### Nosocomial pneumonia

**Adult: IV** INF 10 mg/kg q24hr × 7-21 days

### Renal dose

**Adult:** IV CCr 30-50 ml/min 7.5 mg/kg q24hr; CCr 10-29 ml/min 10 mg/kg q48hr

**Available forms:** Lyophilized powder for inj 250, 750 mg

### Implementation

- Use only for susceptible organisms to prevent drug-resistant bacteria
- Give antihistamine if red man syndrome occurs: decreased B/P, flushing of neck, face
- Store in refrigerator
- Have EPINEPHrine, suction, tracheostomy set, endotracheal intubation equipment on unit; anaphylaxis may occur
- Give adequate intake of fluids (2 L/day) to prevent nephrotoxicity
- Avoid IM, subcut use

**Intermittent IV infusion route**

- Administer after reconstituting with 15 ml $D_5W$ sterile water for inj; 0.9% NaCl (15 mg/ml) 250 mg vial; add 45 ml to 750 mg vial (15 mg/ml) for dose of 150-800 mg; further dilute with 100-250 ml of compatible sol; for dose <150 mg or 800 mg, further dilute to a conc of 0.6-8 mg/ml with compatible sol; give over 60 min, avoid rapid IV, may cause red man syndrome; reconstituted or diluted solution is stable for 4 hr at room temperature, 7 hr refrigerated

**Y-site compatibilities:** Amphotericin B lipid complex (Abelcet), ampicillin-sulbactam, azithromycin, calcium gluconate, caspofungin, cefepime, cefTAZidime, cefTRIAXone, ciprofloxacin, dexamethasone, diltiazem, DOBUTamine, DOPamine, doripenem, doxycycline, ertapenem, famotidine, fluconazole, gentamicin, hydrocortisone, labetalol, magnesium sulfate, mannitol, meropenem, metoclopramide, milrinone, norepinephrine, ondansetron, pantoprazole, phenylephrine, piperacillin-tazobactam, potassium chloride/phosphates, ranitidine, sodium bicarbonate, sodium phosphates, tigecycline, tobramycin, vasopressin

## ADVERSE EFFECTS

**CNS:** Anxiety, chills, flushing, headache, insomnia, dizziness
**CV:** QT prolongation, irregular heartbeat
**EENT:** Hearing loss
**GI:** Nausea, vomiting, pseudomembranous colitis, abdominal pain, constipation, diarrhea, metallic/soapy taste
**GU:** Nephrotoxicity, *increased BUN, creatinine,* renal failure, foamy urine
**HEMA:** Leukopenia, eosinophilia, anemia, thrombocytopenia
**INTEG:** Chills, fever, rash, thrombophlebitis at inj site, urticaria, pruritus, necrosis (red man syndrome)
**SYST:** Anaphylaxis, superinfection

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown, protein binding 90% |
| **Metabolism** | Unknown, hepatic metabolism |
| **Excretion** | Urine 76% |
| **Half-life** | 8-9 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Adefovir, amphotericin B, bacitracin, cidofovir, CISplatin, colistin, cycloSPORINE, foscarnet, ganciclovir, IV pentamidine, acyclovir, pamidronate, polymyxin, streptozotocin, tacrolimus, zoledronic acid: increased toxicity, nephrotoxicity

Chloroquine, clarithromycin, dronedarone, droperidol, erythromycin, grepafloxacin, haloperidol, levomethadyl, methadone, pimozide, ziprasidone: increased QT prolongation

### Drug classifications

Aminoglycosides, cephalosporins, nondepolarizing muscle relaxants: increased toxicity, nephrotoxicity

Class IA, III antidysrhythmics, some phenothiazines: increased QT prolongation

### Drug/lab test

False increase: INR, PT, PTT

## NURSING CONSIDERATIONS

### Assessment

- **Nephrotoxicity:** Monitor I&O ratio; report hematuria, oliguria; avoid in those with CCr

≤50 mL/min; more common in those with diabetes, heart failure, hypertension, geriatrics, renal disease
- Monitor C&S throughout treatment
- Assess auditory function during, after treatment, hearing loss, ringing, roaring in ears; product should be discontinued
- **Pseudomembranous colitis:** Monitor for diarrhea, fever, blood in stools, abdominal cramps; may be several weeks after therapy ends; report to prescriber immediately

**BLACK BOX WARNING:** Pregnancy/breastfeeding: Obtain a pregnancy test before use; if a woman has taken this product during pregnancy, the national registry should be notified at 866-658-4228

- **Anaphylaxis:** Monitor for rash, itching, wheezing, laryngeal edema; discontinue and notify prescriber immediately; emergency equipment and EPINEPHrine should be nearby
- Monitor B/P during administration; sudden drop may indicate red man syndrome; also flushing, pruritus, rash, use slow IV infusion to prevent
- Assess respiratory status: rate, character, wheezing, tightness in chest

### Patient/family education
- Teach all aspects of product therapy; culture may be taken after completed course of medication
- Advise patient to notify prescriber if infection continues
- That bitter taste, nausea, vomiting, headache may occur
- Advise to report sore throat, fever, fatigue; could indicate superinfection; diarrhea (pseudomembranous colitis); hearing loss; rash, wheezing, tightness of chest, itching, tightening of throat (anaphylaxis)

**BLACK BOX WARNING:** Teach patient to use contraception while taking this product; do not breastfeed; to notify prescriber if pregnancy is planned or suspected

### Evaluation
**Positive therapeutic outcome**
- Negative culture

## telbivudine (Rx)
(tel-bi'vyoo-deen)
**Sebivo, Tyzeka**
*Func. class.:* Antiretroviral
*Chem. class.:* Nucleoside reverse transcriptase inhibitor (NRTI)

**ACTION:** Inhibits replication of HBV DNA polymerase, which inhibits HBV replication

**Therapeutic outcome:** Decreased hepatitis B serology

**USES:** Treatment of chronic hepatitis B

## CONTRAINDICATIONS
Hypersensitivity, breastfeeding

**Precautions:** Pregnancy, children, severe renal disease, anemia, organ transplant, dialysis, HIV, obesity, alcoholism; Hispanic or African descent (safety not established)

**BLACK BOX WARNING:** Impaired hepatic function, lactic acidosis

## DOSAGE AND ROUTES
**Adult and adolescent >16 yr:** PO 600 mg/day; max 600 mg/day

### Renal dose
**Adult:** PO CCr 30-49 ml/min 600 mg tab q48hr or 400 mg oral sol/day; CCr <30 ml/min (not requiring dialysis) 600 mg tab q72hr or 200 mg oral sol/day

**Available forms:** Tabs 600 mg

### Implementation
- Give with or without food with a full glass of water
- Store at room temperature

## ADVERSE EFFECTS
**CNS:** *Fever, headache, malaise,* weakness, *dizziness, insomnia*
**EENT:** Taste change, hearing loss, photophobia
**GI:** *Nausea, vomiting, diarrhea, anorexia,* abdominal pain, hepatomegaly, hepatotoxicity
**INTEG:** *Rash*
**MISC:** Lactic acidosis
**MS:** Myalgia, arthralgia, muscle cramps
**RESP:** Cough

### Pharmacokinetics
| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Steady state 5-7 days, protein binding 3.3% |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys, unchanged |
| **Half-life** | Terminal 40-49 hr |

T

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

CycloSPORINE, erythromycin, hydrochloroquine, niacin, penicillamine, zidovudine, ZDV: increased myopathy risk

Do not use with pegylated interferon alfa-2a

### Drug classifications

Any agent altering renal function: altered telbivudine levels

Azole antifungals, corticosteroids, fibric acid derivatives, HMG-CoA reductase inhibitors: increased myopathy risk

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Hepatotoxicity:** Monitor liver function tests, hepatitis B serology, creatine kinase, periodically; monitor HBV DNA after 24 wk, if viral suppression is incomplete (≥300 copies/ml) start alternate therapy, monitor HBV DNA q6mo

**BLACK BOX WARNING: Lactic acidosis, severe hepatomegaly with steatosis:** obtain baseline LFTs, if elevated, discontinue treatment; discontinue even if LFTs are normal but lactic acidosis, hepatomegaly are present, may be fatal

- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, register patients in the Antiretroviral Pregnancy Registry 800-258-4263, do not breastfeed, excreted in breast milk

### Patient/family education

- Advise patient that GI complaints and insomnia may resolve after 3-4 wk of treatment
- Teach patient that product does not cure hepatitis B and does not stop the spread to others
- Teach patient that follow-up visits must be continued
- Teach patient that serious product interactions may occur if OTC products are ingested; check with prescriber before taking
- Advise patient that product may cause dizziness; avoid hazardous activities until response is known
- Teach patient to report symptoms of cough, difficulty sleeping or excessive headache, muscle pain/weakness
- **Teach patient to report progressive liver dysfunction:** light-colored stools, dark urine, poor appetite, nausea, yellowing of skin, eyes
- Advise patient that product will not cure HBV, and precaution should be taken to protect others

### Evaluation

**Positive therapeutic outcome**

- Decreased hepatitis B serology

## telmisartan (Rx)

(tel-mih-sar'tan)

**Micardis**

*Func. class.:* Antihypertensive

*Chem. class.:* Angiotensin II receptor (type $AT_1$)

**ACTION:** Blocks the vasoconstrictor and aldosterone-secreting effects of angiotensin II; selectively blocks the binding of angiotensin II to the $AT_1$ receptor found in tissues

**Therapeutic outcome:** Decreased B/P

**USES:** Hypertension, alone or in combination; stroke, MI prophylaxis (>55 yr) in those unable to take ACE inhibitors

**Unlabeled uses:** Heart failure, proteinuria in diabetic nephropathy

## CONTRAINDICATIONS

Hypersensitivity

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Pregnancy (1st trimester), breastfeeding, children, geriatric, hypersensitivity to angiotensin-converting enzyme (ACE) inhibitors, renal/hepatic disease, renal artery stenosis, dialysis, HF, hyperkalemia, hypotension, hypovolemia, African descent

## DOSAGE AND ROUTES

**Adult:** PO 40 mg/day; range 20-80 mg/day

### Stroke, MI prophylaxis

**Adult >55 yr:** PO 80 mg/day

**Available forms:** Tabs 20, 40, 80 mg

### Implementation

- Give without regard to meals
- Give increased dose to African American, Hispanic patients, B/P response may be reduced
- Do not remove from blister pack until ready to use

## ADVERSE EFFECTS

**CNS:** Dizziness, insomnia, *anxiety,* headache, fatigue, syncope

**GI:** *Diarrhea,* dyspepsia, *anorexia, vomiting*
**META:** Hyperkalemia
**MS:** *Myalgia, pain*
**RESP:** *Cough, upper respiratory tract infection,* sinusitis, pharyngitis
**SYST:** Angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Highly protein bound |
| **Metabolism** | Liver, extensively |
| **Excretion** | Urine/feces |
| **Half-life** | Terminal 24 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 3-hr |
| **Peak** | 0.5-1 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Digoxin: increased digoxin peak, trough concentrations

### Drug classifications

ACE inhibitors, potassium-sparing diuretics, potassium salt substitutes: increased hyperkalemia
Antihypertensives, diuretics, NSAIDs: increased antihypertensive action
NSAIDs, salicylates: decreased antihypertensive effect

### Drug/lab test

Increased: LFTs

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Pregnancy test: if positive, stop treatment, can cause death to fetus, do not breastfeed

- Monitor B/P, pulse q4hr; note rate, rhythm, quality; if severe hypotension occurs, place in supine position **IV** NS, usually occurs during first few weeks of treatment
- Monitor baselines in renal, electrolytes, liver function tests before therapy begins
- Assess edema in feet, legs daily
- Assess skin turgor, dryness of mucous membranes for hydration status
- **Overdose:** dizziness, bradycardia or tachycardia

### Patient/family education

- Instruct patient to comply with dosage schedule, even if feeling better
- Advise patient to notify prescriber immediately of mouth sores, fever, swelling of hands or feet, face, lips irregular heartbeat, chest pain
- Teach patient that excessive perspiration, dehydration, vomiting, diarrhea may lead to fall in blood pressure; consult prescriber if these occur
- Teach patient not to stop medication abruptly, increased B/P will occur

**BLACK BOX WARNING:** Teach patient that product may cause dizziness, fainting; lightheadedness may occur; to avoid hazardous activities until response is known; to rise slowly from sitting to prevent drop in B/P

**BLACK BOX WARNING:** Advise patient to use contraception while taking this product, do not use in pregnancy, breastfeeding

- Teach patient to notify prescriber of all prescriptions, OTC preparations, and supplements taken

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P

**⚠ HIGH ALERT**

## temazepam (Rx)

(tem-az'a-pam)
**Restoril**
*Func. class.:* Sedative-hypnotic
*Chem. class.:* Benzodiazepine, short-intermediate acting
**Controlled substance schedule IV (USA), schedule F (Canada)**

**Do not confuse:** Restoril/RisperDAL

**ACTION:** Produces CNS depression at limbic, thalamic, hypothalamic levels of the CNS; may be mediated by neurotransmitter γ-aminobutyric acid (GABA); results are sedation, hypnosis, skeletal muscle relaxation, anticonvulsant activity, anxiolytic action

**Therapeutic outcome:** Decreased insomnia

**USES:** Insomnia (short-term treatment, generally 7-10 days)

## CONTRAINDICATIONS

Pregnancy **X,** breastfeeding, hypersensitivity to benzodiazepines

**Precautions:** Children <15 yr, geriatric, anemia, pulmonary/renal/hepatic disease, suicidal patients, product abuse, psychosis, acute

T

closed-angle glaucoma, seizure disorders, angioedema, sleep-related behavior (sleep walking), COPD, dementia, myasthenia gravis, intermittent porphyria

**BLACK BOX WARNING:** Coadministration with other CNS depressants

## DOSAGE AND ROUTES

**Adult:** PO 7.5-30 mg at bedtime
**Geriatric:** PO 7.5 mg at bedtime

**Available forms:** Caps 7.5, 15, 22.5, 30 mg

### Implementation

- Without regard to food
- Give with food or milk to decrease GI symptoms; if patient is unable to swallow medication whole, tab may be crushed and mixed with foods or fluids
- Give sugarless gum, hard candy, frequent sips of water for dry mouth

**BLACK BOX WARNING:** Avoid use with CNS depressants; serious CNS depression may result

- Store in tight container in cool environment
- 15-30 min before bedtime for sleeplessness

## ADVERSE EFFECTS

**CNS:** *Lethargy, drowsiness, daytime sedation,* dizziness, confusion, light-headedness, headache, anxiety, irritability, complex sleep-related reactions (sleep driving, sleep eating), fatigue
**CV:** Chest pain, pulse changes, hypotension
**EENT:** Blurred vision
**GI:** Nausea, vomiting, diarrhea, heartburn, abdominal pain, constipation, anorexia
**SYST:** Severe allergic reactions

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed, crosses placenta, crosses blood-brain barrier |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 10-20 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ½ hr |
| **Peak** | 1-2 hr |
| **Duration** | 6-8 hr |

## INTERACTIONS

### Individual drugs

**BLACK BOX WARNING:** Alcohol: increased actions of both products

Cimetidine, disulfiram: increased effect of each specific product
Probenecid: increased effect of temazepam
Rifampin: decreased action of rifampin
Theophylline: decreased effects of theophylline

### Drug classifications

Antacids: decreased effect of antacids
Contraceptives (oral): increased effect
CNS depressants: increased action of both products

### Drug/herb

Chamomile, skullcap, valerian: increased CNS depression

### Drug/food

Caffeine: decreased temazepam effect

### Drug/lab test

Increased: AST/ALT
Decreased: radioactive iodine uptake
False increase: 17-OHCS

## NURSING CONSIDERATIONS

### Assessment

- Assess mental status: mood, sensorium, anxiety, affect, sleeping pattern (baseline, periodically), drowsiness, dizziness, especially geriatric; physical dependency, withdrawal symptoms: anxiety, panic attacks, agitation, orientation, headache, nausea, vomiting, muscle pain, weakness; indications of increasing tolerance and abuse
- **Beers:** Avoid in older adults, increased sensitivity to benzodiazepines and decreased metabolism, may cause delirium

### Patient/family education

- Inform patient that product may be taken with food, and that tab may be crushed or swallowed whole
- Advise patient not to use for everyday stress or longer than 3 mo unless directed by prescriber; not to take more than prescribed amount; may be habit forming; not to double or skip doses
- Caution patient to avoid OTC preparations unless approved by prescriber; alcohol and CNS depressants will increase CNS depression, may cause dizziness, drowsiness
- Advise patient to avoid driving, activities that require alertness, drowsiness may occur; to avoid alcohol ingestion or other psychotropic medications; to rise slowly or fainting may occur, especially in geriatric; that drowsiness may worsen at beginning of treatment

• Caution patient not to discontinue medication abruptly after long-term use; withdrawal symptoms include vomiting, cramping, tremors, seizures
• Advise patient to use contraception while taking this product, to notify prescriber if pregnancy is planned or suspected, do not use in pregnancy, cautious use in breast-feeding, excretion unknown
• Advise patient that complex sleep-related behavior may occur (sleep driving/eating/walking)
• Teach patient to limit to 7-10 days continuous use, to take as directed, not to increase dose unless approved by prescriber

### Evaluation

**Positive therapeutic outcome**
• Decreased anxiety, restlessness, sleeplessness (short-term treatment only)

## TREATMENT OF OVERDOSE:
Lavage, VS, supportive care

**⚠ HIGH ALERT**

## temozolomide (Rx)
(tem-oo-zole'oo-mide)
**Temodar**
*Func. class.:* Antineoplastic alkylating agents
*Chem. class.:* Imidazotetrazine derivative

**ACTION:** A proproduct that undergoes conversion to 5-(3-methyl-1-triazeno) imidazole-4-carboxamide (MTIC); MTIC action prevents DNA transcription

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** Anaplastic astrocytoma with relapse, glioblastoma multiforme, malignant glioma

**Unlabeled uses:** Metastatic melanoma

## CONTRAINDICATIONS
Pregnancy, breastfeeding, hypersensitivity to this product, carbazine, or gelatin

**Precautions:** Radiation therapy, renal/ hepatic disease, bone marrow suppression, infection, geriatric, myelosuppression

## DOSAGE AND ROUTES
### Anaplastic astrocytoma
**Adult:** PO adjust dose based on nadir neutrophil and platelet counts 150 mg/m$^2$/day × 5 days during 28-day cycle

### Glioblastoma multiforme
**Adult:** PO/**IV** 75 mg/m$^2$/day × 42 days with focal radiotherapy; maintenance dose 150 mg/m$^2$ on day 1-5 of a 28 day cycle × 6 cycles

### Malignant glioma
**Adult:** 150 mg/m$^2$/day over 90 min day 1-5, q28day; may increase to 200 mg/m$^2$/day on day 1-5, q28day if hematologic parameters permit

**Available forms:** Caps 5, 20, 100, 140, 180, 250 mg; powder for inj 100 mg

### Implementation
**PO route**
• Give fluids **IV** or PO before chemotherapy to hydrate patient
• Give antiemetic 30-60 min before giving product to prevent vomiting, and prn; antibiotics for prophylaxis of infection
• Capsules should not be opened; if accidentally damaged, do not allow contact with skin, or inhale; take caps one at a time with 8 oz of water at the same time of day; use cytotic handling procedure
• Give on empty stomach at bedtime to prevent nausea/vomiting
• Store in light-resistant container in a dry area

**IV route**
• Bring vial to room temperature, discard if cloudy
• Inject 41 ml sterile water for inj into vial (2.5 mg/ml)
• Gently swirl, do not shake

**Intermittent IV infusion route**
• Withdraw up to 40 ml from each vial to make total dose and transfer to empty 250 ml PVC inf bag, flush before and after inf
• Run over 90 min
• Use reconstituted sol within 14 hr including inf time
• Do not admix

## ADVERSE EFFECTS
**CNS:** Seizures, hemiparesis, dizziness, poor coordination, amnesia, insomnia, paresthesia, somnolence, paresis, ataxia, anxiety, dysphagia, depression, confusion
**GI:** Nausea, anorexia, vomiting, abdominal pain, constipation
**GU:** Urinary incontinence, UTI, frequency
**HEMA:** Thrombocytopenia, leukopenia, anemia, myelosuppression, neutropenia
**INTEG:** Rash, pruritus
**MISC:** Headache, fatigue, asthenia, fever, edema, back pain, weight increase, diplopia
**RESP:** Upper respiratory tract infection, pharyngitis, sinusitis, coughing
**SYST:** Anaphylaxis, secondary malignancy

T

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid, complete |
| **Distribution** | Crosses blood-brain barrier |
| **Metabolism** | To MTIC and metabolite |
| **Excretion** | Urine, feces |
| **Half-life** | 1.8 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Digoxin: decreased action of digoxin
Radiation: increased toxicity, bone marrow suppression

### Drug classifications

Anticoagulants, NSAIDs, platelet inhibitors, thrombolytics: increased bleeding risk
Antineoplastics: increased bone marrow suppression
Live virus vaccines, toxoids: increased adverse reactions, decreased antibody reaction

### Drug/food

Decreased drug absorption

### Drug/lab test

Decreased: Hgb, platelets, WBC, neutrophils

## NURSING CONSIDERATIONS

### Assessment

- Assess symptoms indicating severe allergic reaction: rash, pruritus, urticaria, purpuric skin lesions, itching, flushing; product should be discontinued
- Assess tumor response during treatment
- Obtain CBC on day 22 (21 days after 1st dose), CBC weekly until recovery if ANC is $<1.5 \times 10^9$/L and platelets $<100 \times 10^9$/L, do not administer to patients that do not tolerate 100 mg/m$^2$; myelosuppression usually occurs late in the treatment cycle
- Assess for seizures, mental status throughout treatment
- Monitor renal function studies: BUN, creatinine, urine CCr before, during therapy; I&O ratio; report fall in urine output to <30 ml/hr
- Monitor temp q4hr (may indicate beginning of infection)
- Monitor liver function tests before, during therapy (bilirubin, AST, ALT, LDH) as needed or monthly; note jaundice of skin or sclera, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea; hepatotoxicity can be serious and fatal
- Assess for bleeding: hematuria, stool guaiac, bruising or petechiae, mucosa or orifices; check for inflammation of mucosa, breaks in skin
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

- Teach patient to avoid use of products containing aspirin or NSAIDs, razors, commercial mouthwash, since bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools)
- Instruct patient to report signs of anemia (fatigue, headache, irritability, faintness, shortness of breath)
- Caution patient not to have any vaccinations without the advice of prescriber; serious reactions can occur
- Advise patient contraception is needed during treatment and for several months after completion of therapy; product has teratogenic properties, pregnancy, not to breastfeed

### Evaluation

**Positive therapeutic outcome**

- Prevention of rapid division of malignant cells

**RARELY USED**

## temsirolimus (Rx)

(tem-sir-oh'li-mus)
**Torisel**
*Func. class.:* Biological response modifier
*Chem. class.:* Kinase inhibitor, mTOR antagonist

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity to this product or to sirolimus, polysorbate 80

**Precautions:** Children <13 yr, females, severe pulmonary/renal/hepatic disease (bilirubin >1-1.5 × ULN or AST > ULN, but bilirubin ≤ULN), diabetes mellitus, hyperkalemia, hyperuricemia, hypertension, bone marrow suppression, hypertriglyceridemia/hyperlipidemia, surgery, brain tumor

## DOSAGE AND ROUTES

**Adult: IV** 25 mg over 30-60 min qwk; treat until disease progression or severe toxicity occurs

### Hepatic dose

**Adult:** IV (mild impairment) (bilirubin >1-1.5 × ULN or AST > ULN but bilirubin ≤ ULN)

**⚠ HIGH ALERT**

## tenecteplase (TNK-tPA) (Rx)

(ten-ek'ta-place)
**TNKase**
*Func. class.:* Thrombolytic
*Chem. class.:* Tissue plasminogen activator

**Do not confuse:** TNKase/Activase

**ACTION:** Activates conversion of plasminogen to plasmin (fibrinolysin): plasmin breaks down clots (fibrin), fibrinogen, factors V, VII; occlusion of venous access lines

**Therapeutic outcome:** Resolution of MI

**USES:** Acute MI, coronary artery thrombosis

## CONTRAINDICATIONS

Hypersensitivity, arteriovenous malformation, aneurysm, active bleeding, intracranial, intraspinal surgery or trauma within 2 mo, CNS neoplasms, severe hypertension, severe renal disease, hepatic disease, history of CVA, increased ICP, stroke

**Precautions:** Pregnancy, breastfeeding, children, geriatric, arterial emboli from left side of heart, hypocoagulation, subacute bacterial endocarditis, rheumatic valvular disease, cerebral embolism/thrombosis/hemorrhage, intraarterial diagnostic procedure or surgery (10 days), recent major surgery, dysrhythmias, hypertension

## DOSAGE AND ROUTES

### Total dose, max 50 mg, based on patient's weight

**Adult <60 kg:** **IV** BOL 30 mg, give over 5 sec
**Adult 60-70 kg:** **IV** BOL 35 mg, give over 5 sec
**Adult 70-80 kg:** **IV** BOL 40 mg, give over 5 sec
**Adult 80-90 kg:** **IV** BOL 45 mg, give over 5 sec
**Adult ≥90 kg:** **IV** BOL 50 mg, give over 5 sec, max 50 mg total dose

**Available forms:** Powder for inj, lyophilized 50 mg

### Implementation

**Intermittent IV infusion route**
- Give as soon as thrombi are identified; not useful for thrombi >1 wk old
- Administer cryoprecipitate or fresh frozen plasma if bleeding occurs
- Give heparin after fibrinogen level >100 mg/dl; heparin inf to increase PTT to 1.5-2 × baseline for 3-7 days; **IV** heparin with loading dose is recommended
- Aseptically withdraw 10 ml of sterile water for inj from diluent vial, use red cannula syringe-filling device, inject all contents of syringe into product vial, direct into powder, swirl, withdraw correct dose, discard any unused sol; stand the shield with dose vertically on flat surface and passively recap the red cannula; remove entire shield assembly by twisting counterclockwise; give by **IV** bol
- **IV** therapy: use upper extremity vessel that is accessible to manual compression
- Provide bed rest during entire course of treatment
- Avoid venous or arterial puncture, inj, rectal temp, any invasive treatment
- Treat fever with acetaminophen or aspirin
- Apply pressure for 30 sec to minor bleeding sites; inform prescriber if this does not attain hemostasis; apply pressure dressing

## ADVERSE EFFECTS

**CV:** Dysrhythmias, hypotension, pulmonary edema, pulmonary embolism, cardiogenic shock, cardiac arrest, heart failure, myocardial reinfarction, myocardial rupture, tamponade, pericarditis, pericardial effusion, thrombosis, CVA
**HEMA:** Decreased Hct, bleeding
**INTEG:** Rash, urticaria, phlebitis at **IV** inf site, itching, flushing
**SYST:** GI, GU, intracranial, retroperitoneal bleeding, surface bleeding, anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Unknown |
| **Half-life** | 20-24 min |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Immediate |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Aspirin, cefamandole, cefoperazone, cefoTEtan, clopidogrel, dipyridamole, indomethacin, phenylbutazone, ticlopidine: increased bleeding potential

### Drug classifications

Anticoagulants, antithrombolytics, glycoprotein IIb, IIIa inhibitors, NSAIDs, SNRIs, SSRIs: increased bleeding

### Drug/herb

Anise, basil, dong quai, fenugreek, feverfew, garlic, ginger, ginkgo, ginseng, green tea, horse chestnut: increased risk of bleeding

### Drug/lab test

Increased: INR, PT, PTT

T

## NURSING CONSIDERATIONS

### Assessment

- **Assess for allergy:** fever, rash, itching, chills; mild reaction may be treated with antihistamines
- Assess for bleeding during 1st hr of treatment; hematuria, hematemesis, bleeding from mucous membranes, epistaxis, ecchymosis; may require transfusion (rare), continue to assess for bleeding for 24 hr
- **AVM, recent surgery, active bleeding: Assess for contraindications before use**
- Monitor blood tests (Hct, platelets, PTT, protime, TT, aPTT) before starting therapy; protime or aPTT must be less than 2 × control before starting therapy; PTT or pro-time q3-4hr during treatment
- **Cholesterol embolism:** assess for blue-toe syndrome, renal failure, MI, cerebral/spinal cord/bowel/retinal infarction, hypertension; can be fatal
- **Assess for hypersensitive reactions:** fever, rash, dyspnea; product should be discontinued
- Monitor VS, B/P, pulse, respirations, neurologic signs, temp at least q4hr; temp >104° F (40° C) indicates internal bleeding; systolic pressure increase >25 mm Hg should be reported to prescriber
- Assess for neurologic changes that may indicate intracranial bleeding
- **Assess for retroperitoneal bleeding:** back pain, leg weakness, diminished pulses
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excretion unknown

### Patient/family education

- Teach patient to notify prescriber immediately of severe headache
- Advise patient to notify prescriber of bleeding, hypersensitivity, fast, slow, or uneven heart rate, feeling of fainting, blood in urine/stools, nose bleeds
- Teach patient about proper dental care to avoid bleeding

### Evaluation

**Positive therapeutic outcome**

- Resolution of myocardial infarction

## tenofovir (Rx)

(ten-oh-foh'veer)

**Viread, Vemlidy**

*Func. class.:* Antiretroviral

*Chem. class.:* Nucleoside reverse transcriptase inhibitor (NRTI)

**ACTION:** Inhibits replication of HIV-1 virus by competing with the natural substrate and then incorporating into cellular DNA by viral reverse transcriptase, thereby terminating cellular DNA chain

**Therapeutic outcome:** Improved symptoms of HIV-1 infection

**USES:** HIV-1 infection with at least 2 other antiretrovirals, hepatitis B

## CONTRAINDICATIONS

Hypersensitivity

**BLACK BOX WARNING:** Lactic acidosis

**Precautions:** Pregnancy, breastfeeding, children, geriatric, renal disease, hepatic insufficiency, CCr <60 ml/min, osteoporosis, immune reconstitution syndrome

**BLACK BOX WARNING:** Hepatic disease, hepatitis

## DOSAGE AND ROUTES

### For the treatment of HIV infection in combination with other antiretroviral agents

**Adult, adolescent, and child ≥ 35 kg:** PO tablet: 300 mg PO once daily; PO oral powder 300 mg (7.5 scoops) qday with 2-4 oz of soft food

**Child and adolescent weighing 28-34 kg:** PO tablet: 250 mg qday

**Child ≥ 2 yr and older and 22-27 kg:** PO tablet 200 mg qday

**Child ≥ 2 yr and 17-21 kg:** PO tablet 150 mg qday

**Child and adolescent ≥ 2 yr and < 35 kg:** PO oral powder 8 mg/kg/dose qday with 2-4 oz of soft food. Round dose to the nearest 20-mg increment

### For the treatment of chronic hepatitis B infection (Vemlidy)

**Adult: PO** 25 mg q day with food

### Renal dose

**Adult:** PO CCr 30-49 ml/min 300 mg q48hr; CCr 10-29 ml/min 300 mg q72-96hr; CCr <10 ml/min not recommended

**Child ≥2 yr:** PO 8 mg/kg/day approximate; ≥35 kg 300 mg/day; 28-34 kg 250 mg/day; 22-27 kg 200 mg/day; 17-21 kg 150 mg/day

**Available forms:** Tabs 150, 200, 250, 300 mg; oral powder 40 mg/scoop

### Implementation

- Administer PO without regard to meals
- Store at 25° C (77° F)
- Give product 2 hr before or 1 hr after taking didanosine (if used)
- Oral powder: use scoop provided, mix powder into 2-4 oz (¼-½ cup) of applesauce or yogurt, do not mix with liquid, product will not mix; product is bitter; use immediately after mixing, clean scoop

## ADVERSE EFFECTS

**CNS:** *Headache,* asthenia
**GI:** *Nausea, vomiting, diarrhea,* anorexia, *flatulence, abdominal pain,* pancreatitis
**GU:** Renal failure, renal tubular acidosis/necrosis, Fanconi syndrome
**HEMA:** Neutropenia, osteopenia
**INTEG:** *Rash,* angioedema
**META:** Lactic acidosis, hypokalemia, hypophosphatemia
**MS:** *Myopathy,* rhabdomyolysis
**SYST:** Lipodystrophy

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Extravascular space; bound to serum plasma <0.7%, to serum proteins <7.2% |
| **Metabolism** | Unknown |
| **Excretion** | Urine, unchanged (70%-80%) |
| **Half-life** | Terminal 17 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Acyclovir, cidofovir, ganciclovir, valacyclovir, valganciclovir: increased level of tenofovir
Didanosine: increased level of didanosine when coadministered with tenofovir

### Drug classifications

Increased: levels of tenofovir with any product that decreases renal function

## NURSING CONSIDERATIONS

### Assessment

- Monitor viral load, CD4+ T cell count, plasma HIV RNA, serum creatinine/BUN/phosphate

**BLACK BOX WARNING: Hepatitis exacerbations:** Monitor resistance testing at start of therapy and at treatment failure

- Assess liver function tests: AST, ALT, bilirubin; amylase, lipase, triglycerides periodically during treatment
- **Assess for bone, renal toxicity:** if bone abnormalities are suspected, obtain tests: serum phosphorus, creatinine

**BLACK BOX WARNING:** Lactic acidosis, severe hepatomegaly with steatosis: Obtain baseline LFTs, if elevated discontinue treatment; discontinue even if LFTs are normal but lactic acidosis, hepatomegaly are present, may be fatal

- **Pregnancy/breastfeeding:** Use only if clearly needed, register pregnant patient in the Antiretroviral Pregnancy Registry 800-258-4263, do not breastfeed

### Patient/family education

- Instruct patient to take this product 2 hr before or 1 hr after taking didanosine (if used)
- Instruct patient to take product with meal
- Advise patients that GI complaints resolve after 3-4 wk of treatment
- Caution patient not to breastfeed while taking this product
- Inform patient that product must be taken daily even if patient feels better
- Advise patient to continue follow-up visits since serious toxicity may occur; blood counts must be done q2wk
- Inform patient that product controls symptoms but is not a cure for HIV; patient is still infectious, may pass HIV virus on to others
- Advise patient that other products may be necessary to prevent other infections
- Advise patient that changes in body fat distribution may occur usually breast, neck, back

**BLACK BOX WARNING:** Lactic acidosis: teach patient symptoms of lactic acidosis, to notify prescriber (nausea, vomiting, weakness, abdominal pain)

### Evaluation

**Positive therapeutic outcome**

- Decrease in signs/symptoms of HIV

## terazosin (Rx)

(ter-ay'zoe-sin)
*Func. class.:* Antihypertensive
*Chem. class.:* α-Adrenergic blocker (peripherally acting)

**ACTION:** Peripheral blood vessels are dilated, peripheral resistance is lowered; reduction in blood pressure results from α-adrenergic receptors being blocked

**Therapeutic outcome:** Decreased B/P in hypertension, decreased symptoms of benign prostatic hyperplasia (BPH)

**USES:** Hypertension, as a single agent or in combination with diuretics or β-blockers, BPH

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, prostate cancer, renal disease, syncope

T

## DOSAGE AND ROUTES

### Hypertension

**Adult:** PO 1 mg at bedtime, may increase dosage slowly to desired response; max 20 mg/day divided q12hr

### Benign prostatic hyperplasia

**Adult:** PO 1 mg at bedtime, gradually increase up to 5-10 mg, max 20 mg divided q12hr

**Available forms:** Caps 1, 2, 5, 10 mg

### Implementation

- May be used in combination with other antihypertensives
- Give at same time each day
- May be given with food to prevent GI symptoms
- Store in airtight container at 86° F (30° C) or less
- If treatment is interrupted for several days, restart with initial dose
- Give without regard to food
- Feeding tube: place cap in 60 ml of warm tap water, stir until liquid spills from ruptured shell (5 min), stir until cap dissolves, draw solution into oral syringe, give through feeding tube, flush with water

## ADVERSE EFFECTS

**CNS:** *Dizziness, headache, drowsiness,* anxiety, depression, vertigo, weakness, fatigue, syncope
**CV:** *Palpitations, orthostatic hypotension,* tachycardia, *edema,* rebound hypertension
**EENT:** Blurred vision, epistaxis, tinnitus, dry mouth, red sclera, nasal congestion, sinusitis
**GI:** *Nausea,* vomiting, diarrhea, constipation, abdominal pain
**GU:** Urinary frequency, incontinence, impotence, priapism
**RESP:** Dyspnea, cough, pharyngitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Not known |
| **Metabolism** | Liver (50%) |
| **Excretion** | Kidneys unchanged (10%), feces unchanged (20%) |
| **Half-life** | 9-12 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 15 min |
| **Peak** | 2-3 hr |
| **Duration** | 24 hr |

## INTERACTIONS

### Individual drugs

Alcohol, nitroglycerin, verapamil: increased hypotensive effects, not to drink alcohol

### Drug classifications

Antihypertensives (other): increased hypotension
β-Blockers: increased hypotensive effects
Estrogens, NSAIDs, salicylates, sympathomimetics: decreased antihypertensive effect

### Drug/herb

Hawthorn: increased antihypertensive effect
Ephedra: decreased antihypertensive effect

## NURSING CONSIDERATIONS

### Assessment

- **Hypertension:** monitor B/P, orthostatic hypotension, syncope; check for edema in feet, legs daily; I&O ratio; weight daily; notify prescriber of changes
- **Benign prostatic hyperplasia (BPH):** assess urinary patterns (hesitancy, frequency, change in stream, dribbling, dysuria, urgency)
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excretion unknown
- **Beers:** Avoid use in older adults as an antihypertensive, high risk of orthostatic hypotension

### Patient/family education

- Caution patient not to discontinue product abruptly; the importance of complying with dosage schedule, even if feeling better; if dose is missed take as soon as remembered; take medication at same time each day
- Teach patient not to use OTC products (cough, cold, allergy) unless directed by prescriber; to avoid large amounts of caffeine
- Emphasize the need to rise slowly to sitting or standing position to minimize orthostatic hypotension
- Teach patient to notify prescriber of mouth sores, sore throat, fever, swelling of hands or feet, irregular heartbeat, chest pain
- Caution patient to report excessive perspiration, dehydration, vomiting, diarrhea; may lead to fall in B/P
- Caution patient that product may cause dizziness, fainting, light-headedness; may occur during 1st few days of therapy; to avoid hazardous activities
- **Hypertension:** teach patient how to take B/P and normal readings for age group; to take B/P q7day; to continue with regimen including diet and exercise

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P in hypertension
- Decreased symptoms of BPH

## TREATMENT OF OVERDOSE:

Administer volume expanders or vasopressors; discontinue product; place patient in supine position

## terbinafine, oral (Rx)

(ter-bin′a-feen)
**LamISIL, Lamisil AT**
*Func. class.:* Antifungal, systemic
*Chem. class.:* Synthetic allylamine derivative

**Do not confuse:** LamISIL/LaMICtal/lamoTRIgine

**ACTION:** Interferes with cell membrane permeability in fungi such as *Trichophyton rubrum, Trichophyton mentagrophytes, Trichophyton tonsurans, Epidermophyton floccosum, Microsporum canis, Microsporum audouinii, Microsporum gypseum, Candida*, broad-spectrum antifungal

**Therapeutic outcome:** Resolution of fungal infection

**USES:** Onychomycosis of the toenail or fingernail due to dermatophytes, tinea capitis/corporis/cruris/pedis/versicolor

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, chronic/active renal/hepatic disease GFR ≤50 mg/min, immunosuppression

## DOSAGE AND ROUTES

**Adult:** PO 250 mg/day × 6 wk (fingernail); × 12 wk (toenail)

**Available forms:** Tabs 250 mg; oral granules 125, 187.5 mg

### Implementation

- **PO:** give without regard to food
- **Granules:** take with food, sprinkle packet contents on pudding or non-acidic soft food, swallow without chewing, do not use fruit-based foods
- Store at 25° C (77° F), protect from light

## ADVERSE EFFECTS

**CNS:** Depression
**EENT:** Tinnitus, hearing impairment
**GI:** Diarrhea, dyspepsia, abdominal pain, nausea, hepatitis
**HEMA:** Neutropenia
**INTEG:** Rash, pruritus, urticaria, Stevens-Johnson syndrome, photosensitivity
**MISC:** Headache, hepatic enzyme changes, taste, visual/olfactory disturbance

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 80% |
| **Distribution** | Extensive, most to hair, scalp, nails; excreted in breast milk; protein binding 99% |
| **Metabolism** | Liver, extensively |
| **Excretion** | Unknown |
| **Half-life** | 22 days or longer |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Up to 1 wk |
| **Peak** | Several days-weeks |
| **Duration** | Several weeks |

## INTERACTIONS

### Individual drugs

Atomoxetine: decreased metabolism of atomoxetine
Cimetidine: increased effect
CycloSPORINE: increased cycloSPORINE clearance
Dextromethorphan: increased levels
Rifampin: increased terbinafine clearance

### Drug/herb

Cola nut, guarana, yerba maté, tea (black, green), coffee: side effects

### Drug/lab test

Increased: LFTs

## NURSING CONSIDERATIONS

### Assessment

- Assess hepatic studies (ALT, AST) before beginning treatment; do not use in presence of hepatic disease
- Monitor CBC in treatment >6 wk
- Assess for continuing infection
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, avoid during pregnancy, breastfeeding

### Patient/family education

- Teach patient to notify prescriber of nausea, vomiting, fatigue, jaundice, dark urine, clay-colored stool, RUQ pain, that may indicate hepatic dysfunction
- Teach patient to avoid using OTC medication unless approved by prescriber
- Teach patient that treatment may take 12 wk (toenail), 6 wk (fingernail)
- Teach patient to take without regard to meals, granules may be sprinkled on soft food but not chewed, do not mix with fruit-based products
- Advise patient to report vision changes immediately

T

## Evaluation

**Positive therapeutic outcome**
- Decrease in size, number of lesions

## terbinafine topical

*See Appendix B*

## terbutaline (Rx)

(ter-byoo′ta-leen)
**Bricanyl**
*Func. class.:* Selective $\beta_2$-agonist; bronchodilator
*Chem. class.:* Catecholamine

**Do not confuse:** Brethine/Methergine

**ACTION:** Relaxes bronchial smooth muscle by direct action on $\beta_2$-adrenergic receptors through accumulation of cyclic AMP at β-adrenergic receptor sites; results are bronchodilatation, diuresis, and CNS and cardiac stimulation; relaxes uterine smooth muscle

**Therapeutic outcome:** Bronchodilatation with ease of breathing

**USES:** Bronchospasm

**Unlabeled uses:** Premature labor

## CONTRAINDICATIONS

Hypersensitivity to sympathomimetics; closed-angle glaucoma, tachydysrhythmias

**Precautions:** Pregnancy, breastfeeding, geriatric, cardiac disorders, hyperthyroidism, diabetes mellitus, prostatic hypertension, hypertension, seizure disorder

**BLACK BOX WARNING:** Labor

## DOSAGE AND ROUTES

### Bronchospasm

**Adult and child >12 yr:** PO 2.5-5 mg q8hr; SUBCUT 0.25 mg q15-30min, max 0.5 mg in 4 hr
**Adolescent ≤15 yr and child ≥12 yr:** PO 2.5 mg tid, max 7.5 mg/day

### Renal dose

**Adult:** PO CCr 10-50 ml/min 50% of dose; CCr <10 ml/min avoid use

### Severe renal failure

**Adult:** PO avoid if GFR <10 ml/min

### Tocolytic (preterm labor) (unlabeled)

**Adult:** SUBCUT 0.25 mg q20min to 6 hr, hold if pulse >120 bpm

**Available forms:** Tabs 2.5, 5 mg; inj 1 mg/ml

## Implementation

- Use this medication before other medications and allow 5 min between each to prevent overstimulation

**PO route**
- Give PO with meals to decrease gastric irritation; tab may be crushed and mixed with food or fluid

**SUBCUT route**
- May give by SUBCUT route; do not give by IM route

**Aerosol route**
- Give after shaking; ask patient to exhale, place mouthpiece in mouth, then inhale slowly; hold breath, remove, exhale slowly; allow at least 1 min between inhalations
- Store in light-resistant container, do not expose to temperatures over 86° F (30° C)

**IV route**
- Give at 5 mcg q10min until contractions are stopped; use inf pump for correct dose; after ½-1 hr with no contraction decrease dose by 5 mcg; switch to PO dose when possible

**Y-site compatibilities:** Regular insulin

## ADVERSE EFFECTS

**CNS:** Tremors, anxiety, insomnia, headache, dizziness, stimulation
**CV:** Palpitations, tachycardia, hypertension, dysrhythmias, cardiac arrest, QT prolongation
**GI:** Nausea, vomiting
**META:** Hypokalemia, hyperglycemia
**RESP:** Paradoxical bronchospasm, dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (SUBCUT), partially absorbed (PO) |
| **Distribution** | Unknown |
| **Metabolism** | Liver, partially |
| **Excretion** | Unknown |
| **Half-life** | PO 3-4 hr, subcut 5-7 hr |

### Pharmacodynamics

| | PO | INH | SUBCUT | IV |
|---|---|---|---|---|
| **Onset** | ½ hr | 5-15 min | 10-15 min | Rapid |
| **Peak** | 1-2 hr | 1-2 hr | ½-1 hr | Unknown |
| **Duration** | 4-8 hr | 4-6 hr | 1½-4 hr | Unknown |

## INTERACTIONS

### Individual drugs

Arsenic trioxide, chloroquine, droperidol, haloperidol, levomethadyl, pentamidine: increased QT prolongation

### Drug classifications

Beta agonists, class IA/III antidysrhythmics, CYP3A4 inhibitors (amiodarone, clarithromycin, erythromycin, telithromycin, troleandomycin), CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone), local anesthetics, some phenothiazines, tricyclics: increased QT prolongation

β-Adrenergic blockers: do not use together, block therapeutic effect

MAOIs: increased chance of hypertensive crisis

Sympathomimetics: increased effects of both products

### Drug/herb

Green tea (large amounts), guarana: increased effect

## NURSING CONSIDERATIONS

### Assessment

- **Monitor respiratory function:** vital capacity, FEV, ABGs, lung sounds, heart rate, rhythm (baseline)
- Determine that patient has not received theophylline therapy before giving dose; assess client's ability to self-medicate
- Monitor for evidence of allergic reactions; withhold dose and notify prescriber
- **Assess for paradoxical bronchospasm:** dyspnea, wheezing; keep emergency resuscitative equipment nearby

**BLACK BOX WARNING: Assess for labor:** maternal heart rate, B/P, contractions, fetal heart rate; can inhibit uterine contractions, labor; monitor for hypoglycemia, do not use injectable product for prevention or treatment over 72 hr in preterm labor; do not use oral product for preterm labor, avoid in breastfeeding

### Patient/family education

- Advise patient not to use OTC medications; extra stimulation may occur; to use this medication before other medications and allow at least 5 min between each to prevent overstimulation
- Teach patient how to use inhaler; to avoid getting aerosol in eyes because blurring may result; to wash inhaler in warm water daily and dry; to avoid smoking, smoke-filled rooms, persons with respiratory infections; review package insert with patient
- Teach patient that paradoxical bronchospasm may occur; to stop product immediately and notify prescriber; to limit caffeine products such as chocolate, coffee, tea, and colas
- Instruct patient on administration of dose, not to use more than prescribed; serious side effects may occur; if taking PO regularly and dose is missed, take when remembered; space other doses on new time schedule

### Evaluation

**Positive therapeutic outcome**

- Absence of dyspnea, wheezing after 1 hr
- Improved airway exchange
- Improved ABGs

## TREATMENT OF OVERDOSE:

Administer a $\beta_2$-adrenergic blocker

## terconazole vaginal antifungal

*See Appendix B*

## teriflunomide

(ter'i-floo'noe-mide)

**Aubagio**

*Func. class.:* Multiple sclerosis agent

*Chem. class.:* Pyrimidine synthesis inhibitor

**ACTION:** Antiproliferative effects including peripheral T- and B-lymphocytes, might reduce inflammatory demyelination

**Therapeutic outcome:** Decreased symptoms of MS

**USES:** Reduction of the frequency of relapses or remitting MS

## CONTRAINDICATIONS

Hypersensitivity

**BLACK BOX WARNING:** Pregnancy:

**Precautions:** Breastfeeding, alcoholism, diabetes mellitus, eosinophilic pneumonia, hepatitis, jaundice, male-mediated teratogenicity, pneumonitis, pulmonary disease/fibrosis, sarcoidosis, TB, vaccination

**BLACK BOX WARNING:** Hepatic disease, contraception requirements, male medicated teratogenicity

## DOSAGE AND ROUTES

**Adult: PO** 7 or 14 mg/day

**Available forms:** Tabs 7, 14 mg

### Implementation

**PO route**

May be taken without regard to food

## ADVERSE EFFECTS

**CNS:** Anxiety, headache

**CV:** Palpitations, hypertension, MI

**EENT:** Blurred vision, conjunctivitis, sinusitis
**GI:** Nausea, vomiting, diarrhea, cystitis
**HEMA:** Leukopenia, lymphopenia, neutropenia
**INTEG:** Acne vulgaris, alopecia, pruritus
**META:** Weight loss
**MISC:** Infection, cystitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding >99% |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Median 18–19 days, peak 1–4 hr |

## INTERACTIONS

### Individual drugs

Do not use with leflunomide

CycloSPORINE, eltrombopag, gefitinib: increased teriflunomide effect

**BLACK BOX WARNING:** Methotrexate: increased hepatotoxicity

Zidovudine: increased hematologic toxicity
Repaglinide, pioglitazone, rosiglitazone, PACLitaxel, naproxen, topotecan, bosentan, furosemide: increased effect of each agent
Warfarin, alosetron, DULoxetine, theophylline, tiZANidine, quiNINE, tamoxifen, bendamustine, rasagiline, rOPINIRole, selegiline, propafenone, mexiletine, lidocaine, anagrelide, cloZAPine, cinacalcet, caffeine: decreased effect of each agent, monitor closely
Cholestyramine: decreased effect of teriflunomide

### Drug classifications

Do not use with live virus vaccines
HMG-CoA reductase inhibitors: Increase: hepatotoxicity
Oral contraceptives: increased effect of oral contraceptives

## NURSING CONSIDERATIONS

### Assessment

- CNS symptoms: assess for anxiety, confusion, vertigo
- GI status: assess for diarrhea, vomiting, abdominal pain
- Cardiac status: assess for tachycardia, palpitations, vasodilation, chest pain

**BLACK BOX WARNING:** Pregnancy/breastfeeding: Do not start treatment until pregnancy is ruled out, this product should not be used during or for 2 yr after discontinuing this product, those wishing to become pregnant must discontinue this product and undergo an accelerated elimination procedure, with verification of teriflunomide plasma level <0.02 mg/L, do not use in pregnancy, breastfeeding

### Patient/family education

- Teach patient that blurred vision can occur

**BLACK BOX WARNING:** Advise patient to notify prescriber if pregnancy is planned or suspected

- Inform patient not to change dosing or stop taking without advice of prescriber

### Evaluation

**Positive therapeutic outcome**

- Decreased symptoms of MS

## teriparatide (Rx)

(tah-ree-par'ah-tide)
**Forteo**
*Func. class.:* Parathyroid hormone (rDNA)
*Chem. class.:* Teriparatide

**ACTION:** Contains human recombinant parathyroid hormone, which stimulates new bone growth

**Therapeutic outcome:** Calcium levels at 9-10 mg/dl, decreased symptoms of hypocalcemia, hypoparathyroidism

**USES:** Postmenopausal women with osteoporosis, men with primary or hypogonadal osteoporosis who are at high risk for fracture, glucocorticoid-induced osteoporosis

## CONTRAINDICATIONS

Hypersensitivity, increased baseline risk of osteosarcoma (Paget's disease, open epiphyses, previous bone radiation), bone metastases, history of skeletal malignancies, other metabolic bone diseases, preexisting hypercalcemia

**Precautions:** Pregnancy, breastfeeding, children, urolithiasis, hypotension, use >2 yr

**BLACK BOX WARNING:** Secondary malignancy (osteogenic sarcoma)

## DOSAGE AND ROUTES

**Adult:** SUBCUT 20 mcg/day up to 2 yr (osteoporosis); use for years/lifetime is recommended (glucocorticoid-induced osteoporosis)

**Available forms:** Prefilled pen delivery device (delivers 20 mcg/day)

### Implementation

- Store refrigerated; do not freeze

**SUBCUT route**

- Give by SUBCUT only, rotate inj sites
- Protect from freezing, light; refrigerate pen

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, insomnia, depression, vertigo
**CV:** Hypertension, angina, syncope
**GI:** Nausea, diarrhea, dyspepsia, vomiting, constipation
**INTEG:** Rash, sweating
**MISC:** Pain, asthenia, hyperuricemia
**MS:** Arthralgia, leg cramps, back/leg pain, weakness, osteosarcoma (rare)
**RESP:** Rhinitis, cough, pharyngitis, pneumonia, dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Extensively, rapidly |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | ½ hr |
| **Duration** | 3 hr |

## INTERACTIONS

### Individual drug

Digoxin: increased digoxin toxicity

### Drug/lab test

Increased: calcium, uric acid, urinary calcium
Decreased: magnesium, phosphorus

## NURSING CONSIDERATIONS

### Assessment

- **Secondary malignancy:** osteosarcoma depends on length of treatment, those at higher risk for osteosarcoma should not use this product
- Monitor uric acid, chloride, magnesium, electrolytes, urine pH, vit D, phosphate for normal serum levels; serum calcium may be transiently increased after dosing (max at 4-6 hr after dose)
- Assess for bone pain, headache, fatigue, changes in LOC, leg cramps
- Monitor for signs of persistent hypercalcemia: nausea, vomiting, constipation, lethargy, muscle weakness
- Assess nutritional status: diet for sources of vit D (milk, some seafood), calcium (dairy products, dark green vegetables), phosphates (dairy products)
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, not to be used in pregnancy or breastfeeding

### Patient/family education

- Advise patient of the symptoms of hypercalcemia
- Teach about foods rich in calcium
- Teach how to use delivery device, dispose of needles, not to share pen with others, use at same time of day
- Advise to sit or lie down if dizziness or fast heartbeat occurs after the first few doses
- Pen may be used for 28 days, store in refrigerator, teach how to use, not to share

### Evaluation

**Positive therapeutic outcome**

- Increased bone mineral density

# tesamorelin

(tes-a-moe-rel'in)
**Egrifta**
*Func. class.:* Pituitary hormone, growth hormone modifiers

**ACTION:** Binds to growth hormone releasing factor receptors on the pituitary somatotroph cells; binding stimulates the production, release of endogenous growth hormone (GH)

**Therapeutic outcome:** Decreasing lipodystrophy in HIV patients

**USES:** Treatment of excess abdominal fat in HIV-infected patients with lipodystrophy

## CONTRAINDICATIONS

Hypersensitivity to this product or mannitol, neoplastic disease, pregnancy, disruption of the hypothalamic-pituitary axis (hypothalamic-pituitary-adrenal [HPA] suppression) resulting from hypophysectomy, hypopituitarism, pituitary tumor/surgery, radiation therapy of the head, head trauma, IV/IM administration

**Precautions:** Breastfeeding, CABG, diabetes, diabetic retinopathy, edema, geriatrics, children, infants, adolescents

## DOSAGE AND ROUTES

**Adult:** SUBCUT 2 mg/day

**Available forms:** Powder for injection 1 mg

### Implementation

**SUBCUT route**

- Visually inspect parenteral products for particulate matter and discoloration before use whenever solution and container permit

• To reconstitute use 2, 1 mg vials, inject 2.1 ml sterile water for injection into the first 1-mg vial; use the syringe with the needle already attached. To avoid foaming, push the plunger in slowly with the needle at a slight angle so the sterile water goes down the inside wall of the vial; with the needle and syringe attached to the vial, keep the vial upright and gently roll the vial for 30 sec until mixed; do not shake; remove all contents and put in next 1 mg vial, roll; withdraw 2.1 ml of the reconstituted solution
• Take the syringe out of the vial, place the needle cap on its side against a clean, flat surface; do not touch needle; hold syringe and slide the needle into cap; push the cap all the way or until it snaps shut; do not touch cap until it covers the needle completely
• Remove needle and insert a ½″ 27-G safety injection needle onto the syringe; use immediately; throw away any unused product or used sterile water for injection
• Solution should be clear; do not use if discolored, cloudy, or has particles, but slight foaming is acceptable
• Inject subcut into abdomen; avoid scar tissues, bruises, or the navel; rotate injection sites in the abdomen; slowly push plunger down until all solution has been injected
• After removing the injection from the skin, flip back the needle shield until it snaps, covering the injection needle completely; keep pressing until you hear a click; that means the injection needle is protected
• Use a piece of sterile gauze to rub the injection site clean; if there is bleeding, apply pressure to the injection site with gauze for 30 seconds; if bleeding continues, apply a bandage to the site
• Properly dispose of used syringe, needles, vial, and sterile water for injection bottle in a sharps container

## ADVERSE EFFECTS

**CNS:** Depression, flushing, headache, hypoesthesia, insomnia, night sweats, peripheral neuropathy paresthesias, spasms
**CV:** Chest pain, edema, hypertension, palpitations, peripheral edema
**GI:** Diarrhea, dyspepsia, nausea, upper abdominal pain, vomiting
**INTEG:** Flushing, injection site reactions, pruritus, rash, urticaria
**MS:** Arthralgia, carpal tunnel syndrome, joint swelling, myalgias, stiffness
**RESP:** *Upper respiratory tract infection*
**SYST:** Secondary malignancy

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 26 and 38 mins in healthy and HIV-infected patients, respectively, peak 0.15 hrs |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 0.15 hrs |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Cortisone, predniSONE, simvastatin, ritonavir: decreased effect of each specific product

## NURSING CONSIDERATIONS

### Assessment

• **Lipodystrophy:** Assess for sunken cheeks; thinning arms and legs; fat accumulation in the abdomen, jaws, and back of neck; after treatment these should lessen
• Monitor glycosylated hemoglobin A1C (HbA1C), serum IGF-1 concentrations, ophthalmologic exam
• **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding
• Teach patient that body fat distribution should change
• Teach patient that lab exams will be needed
• **Beers:** Avoid in older adults except as hormone replacement after pituitary gland removal, may cause edema, arthralgia

### Patient/family education

• Explain reason for product and expected result
• Teach patient to use contraception (pregnancy)

### Evaluation

**Positive therapeutic outcome**
• Decreasing lipodystrophy in HIV patients

**testosterone (Rx)**
(tess-toss′te-rone)
**testosterone enanthate (Rx)**
**Delatestryl**
**testosterone undecanoate**
**Aveed**
**testosterone cypionate (Rx)**
**Depo-Testosterone**

## testosterone pellets (Rx)
**Testopel**
## testosterone transdermal (Rx)
**Androderm**
## testosterone gel (Rx)
**AndroGel Fortesta, Testim**
## testosterone buccal (Rx)
**Striant**
## testosterone topical solution (Rx) gel
**Axiron, Vogelxo**
## testosterone nasal gel (Rx)
**Natesto**

*Func. class.:* Androgenic anabolic steroid
*Chem. class.:* Halogenated testosterone derivative
**Controlled substance schedule III**

**Do not confuse:** Testoderm/Testoderm TTS

**ACTION:** Increases weight by building body tissue; increases potassium, phosphorus, chloride, nitrogen levels; increases bone development; responsible for maintenance of secondary sex characteristics (male)

**Therapeutic outcome:** Increased hormone levels in eunuchoidism, decreased tumor growth in female breast cancer, onset of male puberty

**USES:** Female breast cancer, hypogonadism, eunuchoidism, male climacteric, oligospermia, impotence, vulvar dystrophies, low testosterone levels, delayed male puberty (inj)

## CONTRAINDICATIONS
Pregnancy, breastfeeding, severe renal/cardiac/hepatic disease, hypersensitivity, genital bleeding (rare), male breast/prostate cancer

**Precautions:** Diabetes mellitus, CV disease, MI, urinary tract disorders, prostate cancer, hypercalcemia

**BLACK BOX WARNING:** Children, accidental exposure, pulmonary oil microembolism, risk of serious hypersensitivity reactions or anaphylaxis

## DOSAGE AND ROUTES
### Replacement
**Adult: IM** (enanthate or cypionate) 50-400 mg q2-4wk; **TRANSDERMAL** (Testoderm) 4-6 mg applied q24hr; (Androderm, AndroGel) 5 mg applied q24hr; once daily (gel); **TOPICAL SOL** (Axiron) 60 mg (2 pump activations) each AM; **BUCCAL** 1 buccal system (30 mg) to the gum region q12hr before meals/PM
**Adult (male) and child: SUBCUT** (pellets) 150-450 mg (2-6 pellets) inserted q3-6mo

### Breast cancer
**Adult: IM** 50-100 mg 3 ×/wk (propionate) or 200-400 mg q2-4wk (cypionate or enanthate)

### Delayed male puberty
**Child >12 yr: IM** up to 100 mg/mo for up to 6 mo

**Available forms: Enanthate:** inj 200 mg/ml; **cypionate:** inj 100, 200 mg/ml; pellets 75 mg; **transdermal** 2, 4 mg/24 hr; **gel** 1%, 1.62%, 10 mg/actuation; **buccal system** 30 mg; **topical solution** 30 mg/actuation

### Implementation
- Administer diet with increased calories, protein; decreased sodium if edema occurs
- Administer supportive product if anemia occurs
- Give titrated dose; use lowest effective dose
- Give IM inj deep into upper outer quadrant of gluteal muscle; route can be painful

**Transdermal route**
- Apply Testoderm to skin of scrotum, Androderm to skin of back, upper arms, thighs, abdomen; area must be clean and dry, free of hair

**Gel route**
- Products are not interchangeable, dosage and administration for AndroGel 1% differs from AndroGel 1.62%
- Apply daily to clean dry area on shoulders, upper arms, or abdomen; women, children should not touch gel or treated skin

**Buccal system route**
- Do not chew or swallow buccal system
- Rotate sites; place above incisor tooth on either side of mouth
- Open packet; place rounded side of surface against gum and hold firmly in place with finger over lip for 30 sec; if product falls off, replace with new system; discard in trash can away from children or pets

**Topical solution**
- Using the provided applicator, apply the solution to clean, dry, intact skin of the axilla, preferably at the same time each morning. Do not apply to any other part of the body. Allow the solution to dry completely before dressing. If an antiperspirant or deodorant is used, apply at least 2 min before applying the solution. The pump must be primed before the first use by fully depressing the pump mechanism 3 times and discarding any solution that is released during the priming. To dispense the solution, position the nozzle over the applicator cup and carefully depress the pump once fully; the cup should be filled with no more than 1 pump actuation (30 mg). With the applicator upright,

T

place it up into the axilla and wipe steadily down and up into the axilla. Do not use fingers or hand to rub the solution. If multiple applications are necessary for the required dose, alternate application between the left and right axilla. When repeat application to the same axilla is necessary, allow the solution to dry completely before the next application. After use, rinse the applicator under running water and pat dry with tissue. Wash hands with soap and water

- Following application, allow the site to dry a few minutes before putting on clothing
- Direct contact of the medicated skin with the skin of another person can result in the transfer of residual testosterone and absorption by the other person. To reduce accidental transfer, the patient should cover the application site(s) with clothing (e.g., a T-shirt) after the solution has dried. The application site should be washed with soap and water prior to any skin-to-skin contact regardless of the length of time since application. In the case of direct contact, the other person should wash the area of contact with soap and water as soon as possible
- Patients should be advised that the topical solution is flammable; therefore, fire, flame, and smoking should be avoided during use
- Advise patients to avoid swimming or washing the application site until 2 hr following application of solution

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, fatigue, tremors, paresthesias, flushing, sweating, anxiety, lability, insomnia, carpal tunnel syndrome
**CV:** Increased B/P
**EENT:** Conjunctival edema, nasal congestion
**ENDO:** Abnormal GTT
**GI:** Nausea, vomiting, constipation, weight gain, cholestatic jaundice
**GU:** Hematuria, amenorrhea, vaginitis, decreased libido, decreased breast size, clitoral hypertrophy, testicular atrophy, gynecomastia, enlarged prostate
**HEMA:** Polycythemia
**INTEG:** Rash, acneiform lesions, oily hair and skin, flushing, sweating, acne vulgaris, alopecia, hirsutism
**MS:** Cramps, spasms

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well but slowly absorbed |
| **Distribution** | Crosses placenta |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 8 days (cypionate)<br>10-100 min (base) |

### Pharmacodynamics

| | IM (base) | IM (cypionate) | IM (enanthate) | IM (propionate) |
|---|---|---|---|---|
| **Onset** | Unknown | Unknown | Unknown | Unknown |
| **Peak** | Unknown | Unknown | Unknown | Unknown |
| **Duration** | 1-3 days | 2-4 wk | 2-4 wk | 1-3 days |

## INTERACTIONS

### Individual drugs

ACTH, buPROPion: increased edema
Insulin: decreased glucose levels may alter need for insulin
Oxyphenbutazone: increased effects of oxyphenbutazone

### Drug classifications

Adrenal steroids: increased edema
Anticoagulants: increased pro-time
Antidiabetics, oral: decreased need for oral antidiabetics

### Drug/lab test

Increased: serum cholesterol, blood glucose, urine glucose
Decreased: serum Ca, serum K, $T_4$, $T_3$, thyroid $^{131}I$ uptake test, urine 17-OHCS, 17-KS, PBI

## NURSING CONSIDERATIONS

### Assessment

- Monitor patient's weight daily; notify prescriber if weekly weight gain is >5 lb; assess I&O ratio; be alert for decreasing urinary output, increasing edema
- Monitor B/P q4hr, Hgb/Hct
- Assess growth rate, bone age in adolescent because growth rate may be uneven (linear/bone growth) if used for extended periods
- Monitor electrolytes: potassium, sodium, chloride, calcium; cholesterol
- Monitor liver function tests: ALT, AST, bilirubin
- Assess edema, hypertension, cardiac symptoms, jaundice
- Assess mental status: affect, mood, behavioral changes, aggression
- **Assess signs of masculinization** in female: increased libido, deepening of voice, decreased breast tissue, enlarged clitoris, menstrual irregularities; male: gynecomastia, impotence, testicular atrophy
- **Assess hypercalcemia:** lethargy, polyuria, polydipsia, nausea, vomiting, constipation; product may have to be decreased
- **Assess hypoglycemia** in diabetics because oral antidiabetic action is increased

**BLACK BOX WARNING:** Accidental exposure: In children have occurred with the topical product after contact with application site in adults, cover site in adult, cover site with clothing, wash hands with soap and water

**BLACK BOX WARNING:** Anaphylaxis: Usually with testosterone undecanoate (Aveed) oil for injection, may occur after any injection, observe for 30 min after each use, product is contraindicated in those with castor oil, benzyl/alcohol, benzoic acid hypersensitivity

**BLACK BOX WARNING:** Pulmonary embolism: Occurs immediately after 1000 mg IM of testosterone undecanoate, symptoms include cough, dyspnea, chest pain, dizziness, throat tightening and resolve after a few minutes or with supportive measure, some require emergency measures

- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding
- **Beers:** Avoid in older adults unless indicated for confirmed hypogonadism with clinical symptoms, potential for cardiac problems, do not use in prostate cancer

### Patient/family education

- Inform patient that product needs to be combined with complete health plan: diet, rest, exercise
- Caution patient to notify prescriber if therapeutic response decreases; not to discontinue this medication abruptly
- Inform women patients to report menstrual irregularities; about changes in sex characteristics, if pregnancy is planned or suspected
- Discuss that 1-3 mo course is necessary for response in breast cancer
- Inform patient about application of transdermal patches: Testoderm to skin of scrotum, Androderm to skin of back, upper arms, thighs, abdomen; area must be dry and free of hair; may be reapplied after bathing, swimming
- Teach about changes in sex characteristics: priapism, gynecomastia, increased libido

### Evaluation

**Positive therapeutic outcome**

- Decrease size of tumor in breast cancer
- Increased androgen levels

## tetracaine ophthalmic

*See Appendix B*

## tetracaine topical

*See Appendix B*

## tetracycline (Rx)

(tet-ra-sye'kleen)
*Func. class.:* Antiinfective—broad-spectrum
*Chem. class.:* Tetracycline

**ACTION:** Inhibits protein synthesis and phosphorylation in microorganisms; bacteriostatic

**Therapeutic outcome:** Bactericidal action against susceptible organisms: gram-positive pathogens *Bacillus anthracis, Clostridium perfringens, Clostridium tetani, Listeria monocytogenes, Nocardia, Propionibacterium acnes, Actinomyces israelii;* gram-negative pathogens *Haemophilus influenzae, Legionella pneumophila, Yersinia enterocolitica, Yersinia pestis, Neisseria gonorrhoeae, Neisseria meningitidis*

**USES:** Syphilis, *Chlamydia trachomatis,* gonorrhea, lymphogranuloma venereum, uncommon gram-positive, gram-negative organisms, rickettsial infections

### CONTRAINDICATIONS

Pregnancy, breastfeeding, children <8 yr, hypersensitivity to tetracyclines

**Precautions:** Renal/hepatic disease, UV exposure

### DOSAGE AND ROUTES

**Susceptible gram-positive/gram-negative infections**
**Adult:** PO 250-500 mg q6hr
**Child >8 yr:** PO 25-50 mg/kg/day in divided doses q6hr

***Chlamydia trachomatis***
**Adult:** PO 500 mg qid × 7 days

**Syphilis**
**Adult and adolescent:** PO 500 mg qid × 2 wk; if syphilis duration >1 yr, must treat 30 days

**Brucellosis**
**Adult:** PO 500 mg qid × 3 wk with 1 g of streptomycin IM 2 ×/day × 1 wk, and 1 ×/day the 2nd wk

**Urethral, endocervical, rectal infections *(C. trachomatis)***
**Adult:** PO 500 mg qid × 7 days

### Acne

**Adult and adolescent:** PO 250 mg q6hr, then 125-500 mg/day or every other day

### Renal dose

**Adult:** PO CCr 51-90 ml/min give dose q8-12hr, CCr 10-50 ml/min give dose q12-24hr, CCr <10 ml/min give dose q24hr

**Available forms:** Caps 250, 500 mg

### Implementation

**PO route**

- Give around the clock to maintain proper blood levels; give with food to increase absorption of product; do not give within 3 hr of other agents; product interactions may occur; take on an empty stomach (1 hr before or 2 hr after meals)
- Give with 8 oz of water
- Shake liquid preparation well before giving; use calibrated device for proper dosing
- Store in tight, light-resistant container at room temp

## ADVERSE EFFECTS

**CNS:** Fever, headache, paresthesia
**CV:** Pericarditis
**EENT:** Dysphagia, glossitis, decreased calcification (permanent discoloration) of deciduous teeth, oral candidiasis, oral ulcers
**GI:** *Nausea,* abdominal pain, *vomiting, diarrhea,* anorexia, enterocolitis, hepatotoxicity, flatulence, abdominal cramps, epigastric burning, stomatitis, hepatitis, pseudomembranous colitis
**GU:** *Increased BUN,* azotemia, acute renal failure
**HEMA:** Eosinophilia, neutropenia, thrombocytopenia, leukocytosis, hemolytic anemia
**INTEG:** *Rash, urticaria, photosensitivity, increased pigmentation,* exfoliative dermatitis, pruritus, angioedema, Stevens-Johnson syndrome
**MISC:** Increased intracranial pressure, candidiasis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 60%-80% (PO), lower (IM) |
| **Distribution** | Widely distributed, some in CSF; crosses placenta |
| **Metabolism** | Not metabolized |
| **Excretion** | Unchanged—kidneys |
| **Half-life** | 6-10 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 1-2 hr |
| **Peak** | 2-3 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Cimetidine, $NaHCO_3$: decreased tetracycline effect
Digoxin: increased digoxin effect
Iron: forms chelates, decreased absorption
Isotretinoin: Increase: Pseudotumor cerebi avoid concurrent use
Methoxyflurane: fatal nephrotoxicity, do not use together
Warfarin: increased warfarin effect

### Drug classifications

Alkali products, antacids: decreased tetracycline effect
Hormonal contraception: Decrease: possible, but unlikely, use additional contraception
Penicillins: decreased penicillin effect

### Drug/herb

Dong quai: increased photosensitivity

### Drug/food

Decreased: absorption with dairy products; forms insoluble chelate

### Drug/lab test

Increased: BUN, LFTs

## NURSING CONSIDERATIONS

### Assessment

- **Serious skin reactions:** angioedema, Stevens-Johnson syndrome, exfoliative dermatitis, report immediately after stopping product
- Assess patient for previous sensitivity reaction
- Assess patient for signs and symptoms of infection including characteristics of wounds, sputum, urine, stool, WBC >10,000/$mm^3$, temp; obtain baseline information before, during treatment
- Complete C&S testing before beginning product therapy to identify if correct treatment has been initiated
- **Assess for allergic reactions:** rash, urticaria, pruritus, chills, fever, joint pain; angioedema may occur a few days after therapy begins; EPINEPHrine, resuscitation equipment should be available for anaphylactic reaction
- Identify urine output; if decreasing, notify prescriber (may indicate nephrotoxicity); increased BUN, creatinine
- **Pseudomembranous colitis:** assess for diarrhea, abdominal pain, fever, fatigue, anorexia; possible anemia, elevated WBC and low serum albumin; stop product and usually give either vancomycin or IV metroNIDAZOLE

- **Assess for superinfection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum if on prolonged therapy
- **Pregnancy/breastfeeding:** Do not use in pregnancy, toxic to fetus, do not breastfeed, excreted in breast milk

### Patient/family education

- Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
- Advise patient to use sunscreen when outdoors to decrease photosensitivity reaction
- Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate superinfection; report itching, rash, pruritus, urticaria
- Teach patient to take 1 hr before bedtime to prevent esophageal ulceration
- Instruct patient to take all medication prescribed for the length of time ordered; product must be taken around the clock to maintain blood levels; do not give medication to others
- Teach patient to notify prescriber immediately of diarrhea with pus, mucus, fever, abdominal pain
- Teach patient to notify prescriber if pregnancy is planned or suspected
- Teach patient not to use outdated products, as Fanconi syndrome (nephrotoxicity) may occur
- Teach patient that tooth discoloration may occur, especially in children, do not use in child <8 yr, may cause bone formation abnormalities

### Evaluation

**Positive therapeutic outcome**

- Absence of signs/symptoms of infection (WBC <10,000/mm$^3$, temp WNL, absence of red, draining wounds)
- Reported improvement in symptoms of infection, resolution of infection, prevention of malaria

## tetrahydrozoline nasal agent

*See Appendix B*

## tetrahydrozoline ophthalmic

*See Appendix B*

## theophylline (Rx)

(thee-off'i-lin)

**Elixophyllin, Theo-24, Theochron, Uniphyl**

*Func. class.:* Spasmolytic, bronchodilator

*Chem. class.:* Xanthine, ethylenediamine

**ACTION:** Relaxes smooth muscle of respiratory system by blocking phosphodiesterase, which increases cyclic AMP, exact action unknown

**Therapeutic outcome:** Ability to breathe without difficulty

**USES:** Bronchial asthma, bronchospasm of COPD, chronic bronchitis, emphysema

## CONTRAINDICATIONS

Hypersensitivity to xanthines, tachydysrhythmias

**Precautions:** Pregnancy, children, geriatric, HF, cor pulmonale, hepatic disease, active peptic ulcer disease, diabetes mellitus, hyperthyroidism, hypertension, seizure disorder

## DOSAGE AND ROUTES-NTI

### Acute exacerbations of reversible airway obstructions

**Adult:** PO/**IV** 5 mg/kg loading dose over 20-30 min

### COPD, chronic bronchitis

**Adult:** **IV** 0.4 mg/kg/hr in nonsmokers or 0.7 mg/kg/hr in smokers

**Adult, child >45 kg:** Maintenance PO (regular release) 10 mg/kg/day, in divided doses q1-8hr; after 3 days increase dosage to 400 mg in divided doses q6-8hr; after 3 more days increase to 600 mg in divided doses q6-8hr; max 800 mg/day

### Apnea of prematurity

**Neonate:** **IV** 4 mg/kg over 20-30 min, then maintenance **IV**/PO neonate ≥24 days 1.5 mg/kg q12h

**Available forms:** Cap, ext rel 100, 200, 300, 400 mg; tab ext rel 100, 200, 400, 450, 600 mg; elixir 80 mg/15 ml; sol for inj 250 mg/10 ml, 500 mg/20 ml

### Implementation

**PO route**

- Do not crush or chew time release products
- Contents of bead-filled cap may be sprinkled over food for children's use
- Give PO with 8 oz water; to decrease GI symptoms; avoid food, absorption may be affected
- Store diluted sol for 24 hr if refrigerated

T

**IV route**
- Give loading dose over 20-30 min; max 20-25 mg/min; do not give by rapid **IV;** use only by cont inf

**Y-site compatibilities:** Acyclovir, ampicillin, aztreonam, ceFAZolin, cefoTEtan, cefTAZidime, cefTRIAXone, cimetidine, clindamycin, dexamethasone, diltiazem, DOBUTamine, DOPamine, doxycycline, erythromycin, famotidine, fluconazole, gentamicin, haloperidol, heparin, hydrocortisone, lidocaine, methyldopate, methylPREDNISolone, metroNIDAZOLE, midazolam, nafcillin, nitroglycerin, nitroprusside, penicillin G potassium, piperacillin, potassium chloride, ranitidine, ticarcillin, ticarcillin/clavulanate, tobramycin, vancomycin

## ADVERSE EFFECTS

**CNS:** *Anxiety, restlessness, insomnia, dizziness, seizures,* headache, light-headedness, muscle twitching, tremors
**CV:** *Palpitations, sinus tachycardia,* hypotension, dysrhythmias, fluid retention with tachycardia
**ENDO:** Hyperglycemia
**GI:** *Nausea, vomiting, anorexia,* diarrhea, bitter taste, dyspepsia, gastric distress
**INTEG:** Flushing, urticaria
**MISC:** SIADH, urinary frequency
**RESP:** Increased rate, tachypnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO), slowly absorbed (ext rel) |
| **Distribution** | Crosses placenta, widely distributed |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 6.5-10.5 hr; increased in liver disease, HF, geriatric |

### Pharmacodynamics

| | PO | PO–TIME REL | IV |
|---|---|---|---|
| **Onset** | Rapid | Slow | Immediate |
| **Peak** | 1 hr | 4-8 hr | Inf end |
| **Duration** | 6 hr | 12-24 hr | 6-8 hr |

## INTERACTIONS

### Individual drugs

CarBAMazepine: decreased theophylline level
Cimetidine, disulfiram, erythromycin, fluvoxaMINE, influenza vaccine, mexiletine, propranolol: increased theophylline action
Lithium: decreased effect of lithium
PHENobarbital, phenytoin, rifampin: decreased theophylline
Increased: dysrhythmias: halothane

### Drug classifications

Anticoagulants: increased anticoagulant level
β-Adrenergic blockers: cardiotoxicity
Contraceptives (oral), corticosteroids, fluoroquinolones, interferons: increased theophylline action
Smoking: decreased theophylline level

### Drug/herb

Coffee, cola nut, guarana, ma huang (ephedra), tea (black, green), yerba maté: increased toxicity
St. John's wort: decreased theophylline level

## NURSING CONSIDERATIONS

### Assessment

- **Monitor theophylline blood levels** (therapeutic level is 10-20 mcg/ml); toxicity may occur with small increase above 20 mcg/ml, especially in geriatric patients
- Monitor I&O; diuresis occurs; dehydration may result in children or geriatric
- **Assess for signs of toxicity:** irritability, insomnia, restlessness, tremors, nausea, vomiting
- Monitor respiratory rate, rhythm, depth; auscultate lung fields bilaterally; notify prescriber of abnormalities
- **Assess for allergic reactions:** rash, urticaria; if these occur, product should be discontinued
- Obtain liver function studies periodically, lower doses may be required in those with moderate to severe hepatic disease
- **Pregnancy/breastfeeding:** If used, monitor and maintain theophylline level between 5 and 12 mcg, monitor levels carefully in breastfeeding
- **Beers:** Avoid in older adults, CNS stimulant effect

### Patient/family education

- Advise patient to check OTC medications, current prescription medications for ePHEDrine, which increases stimulation, and to avoid alcohol, caffeine
- Caution patient to avoid hazardous activities; dizziness may occur
- Inform patient that if GI upset occurs, to take product with 8 oz of water; avoid food; absorption may be decreased
- **Advise patient to notify prescriber of toxicity:** nausea, vomiting, anxiety, insomnia, seizures
- Advise patient to notify prescriber of change in smoking habit; dosage may have to be changed

### Evaluation

**Positive therapeutic outcome**
- Ability to breathe more easily

## thiamine (vitamin $B_1$) (PO, OTC; IV, IM, Rx)

**Betaxin, Betalin S, Biamine, Revitonus, Thiamilate**

*Func. class.:* Vitamin $B_1$
*Chem. class.:* Water soluble

**Do not confuse:** thiamine/Tenormin

**ACTION:** Needed for pyruvate metabolism, carbohydrate metabolism

**Therapeutic outcome:** Prevention and treatment of thiamine deficiency

**USES:** Vit $B_1$ deficiency or polyneuritis, cheilosis adjunct with thiamine beriberi, Wernicke-Korsakoff syndrome, pellagra, metabolic disorders, alcoholism

### CONTRAINDICATIONS
Hypersensitivity

**Precautions:** Pregnancy

### DOSAGE AND ROUTES
#### RDA
**Adult:** PO (Male) 1.2-1.5 mg; (female) 1.1 mg; (pregnancy) 1.4 mg; (breastfeeding) 1.4 mg
**Child 9-13 yr:** PO 0.9 mg
**Child 4-8 yr:** PO 0.6 mg
**Child 1-3 yr:** PO 0.5 mg
**Infant 6 mo-1 yr:** PO 0.3 mg
**Neonate and infant to 6 mo: PO 0.3 mg**

#### Beriberi
**Adult:** PO 5-30 mg qd or given in 3 divided doses × 1 month; IM/**IV** 5-30 mg qd or in 3 doses, then convert to PO
**Child/infant:** PO 10-50 mg qd × 2 wk, then 5-10 mg qd × 1 mo; **IV**/IM 10-25 mg/day × 2 wk, then 5-10 mg qd × 1 mo

**Available forms:** Tabs 50, 100, 250, 500 mg; inj 100 mg/ml; enteric-coated tabs 20 mg

### Implementation
**IM route**
- Give by IM inj; rotate sites if pain and inflammation occur; do not mix with alkaline sol; Z-track to minimize pain
- Application of cold compress may decrease pain
- Store in airtight, light-resistant container

**Direct IV route**
- **IV** undiluted given over 5 min

**Continuous IV infusion route**
- Dilute in compatible **IV** sol

**Y-site compatibilities:** Famotidine

### ADVERSE EFFECTS
**CNS:** Weakness, restlessness
**CV:** Collapse, pulmonary edema, hypotension
**EENT:** Tightness of throat
**GI:** Hemorrhage, *nausea, diarrhea*
**INTEG:** Angioneurotic edema, cyanosis, sweating, warmth
**SYST:** Anaphylaxis

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO, IM), completely absorbed (**IV**) |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver |
| **Excretion** | Kidneys (unchanged—excess amounts) |
| **Half-life** | Unknown |

#### Pharmacodynamics
Unknown

### NURSING CONSIDERATIONS
#### Assessment
- **Anaphylaxis (IV only):** assess for swelling of face, eyes, lips, throat, wheezing
- **Thiamine deficiency:** assess for anorexia, weakness, pain, depression, confusion, blurred vision, tachycardia
- Assess nutritional status: yeast, beef, liver, whole or enriched grains, legumes
- Application of cold to help decrease pain at injection site
- **Pregnancy/breastfeeding:** Considered compatible with pregnancy, breastfeeding

#### Patient/family education
- Teach patient necessary foods to be included in diet: yeast, beef, liver, legumes, whole grains

#### Evaluation
**Positive therapeutic outcome**
- Absence of nausea, vomiting, anorexia, insomnia, tachycardia, paresthesias, depression, muscle weakness

**RARELY USED**

## thioridazine (Rx)

(thye-or-rid'a-zeen)
*Func. class.:* Antipsychotic (typical)
*Chem. class.:* Phenothiazine, piperidine

**USES:** Psychotic disorders, schizophrenia, behavioral problems in children, anxiety, major depressive disorders, organic brain syndrome

## CONTRAINDICATIONS
Children <2 yr, hypersensitivity, coma, CNS depression

**BLACK BOX WARNING:** QT prolongation, cardiac dysrhythmias

## DOSAGE AND ROUTES
### Psychosis
**Adult:** PO 25-100 mg tid, max dose 800 mg/day; dose is gradually increased to desired response, then reduced to minimum maintenance

### Depression/behavioral problems/organic brain syndrome
**Adult:** PO 25 tid, range from 10 mg bid-qid to 50 mg tid-qid; max 800 mg/day for short period
**Geriatric:** PO 10-25 mg daily-bid, increase 4-7 days by 10-25 mg to desired dose, max 300 mg/day for short period
**Child 2-12 yr:** PO 0.5-3 mg/kg/day in divided doses, max 3 mg/kg/day

**RARELY USED**

## thyroid USP (desiccated) (Rx)
(thye′roid)
**Armour Thyroid, Bio-Throid, Nature Thyroid, NP Thyroid**
*Func. class.:* Thyroid hormone
*Chem. class.:* Active thyroid hormone in natural state and ratio

**Therapeutic outcome:** Correction of lack of thyroid hormone

**USES:** Hypothyroidism, cretinism (juvenile hypothyroidism), myxedema

## CONTRAINDICATIONS
Adrenal insufficiency, MI, thyrotoxicosis, porcine protein hypersensitivity

**BLACK BOX WARNING:** Obesity treatment

## DOSAGE AND ROUTES
### Hypothyroidism
**Adult:** PO 60-65 mg/day, increased by 30 mg qmo until desired response; maintenance dose 65-120 mg/day
**Geriatric:** PO 7.5-15 mg/day, increase dose q6-8wk until desired response

### Cretinism/juvenile hypothyroidism
**Child:** PO 15 mg/day, then 30 mg/day after 2 wk, then 60 mg/day after another 2 wk; maintenance dose 60-180 mg/day

### Myxedema
**Adult:** PO 15 mg/day, double dose q2wk, maintenance 60-180 mg/day

**RARELY USED**

## tiaGABine (Rx)
(tie-ah-ga′been)
**Gabitril**
*Func. class.:* Anticonvulsant

**Do not confuse:** tiaGABine/tiZANidine

**ACTION:** Inhibits reuptake and metabolism of GABA; may increase seizure threshold, structurally similar to GABA; tiaGABine binding sites in neocortex, hippocampus

**USES:** Adjunct treatment of partial seizures in adults and children ≥12 yr

## CONTRAINDICATIONS
Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, child <12 yr, geriatric, renal/hepatic disease, suicidal ideation/behavior, status epilepticus, mania, bipolar disorder, abrupt discontinuation, depression

## DOSAGE AND ROUTES
When not given with a CYP3A4 enzyme, effect of tiaGABine is doubled; lower dosages are indicated
**Adult:** PO (those on an enzyme-inducing antiepileptic) 4 mg/day in divided doses, may increase by 4-8 mg qwk until desired response, max 56 mg/day
**Child 12-18 yr:** PO 4 mg/day, may increase by 4 mg at beginning of wk 2, may increase by 4-8 mg qwk until desired response, max 32 mg/day

### Hepatic dose
**Adult:** PO reduce dose or increase dosing interval

**Available forms:** Tabs 2, 4, 12, 16 mg

### Implementation
- Store at room temperature away from heat and light
- Provide assistance with ambulation during early part of treatment; dizziness occurs
- Provide seizure precautions: padded side rails; move objects that may harm patient
- Use with food

## ADVERSE EFFECTS
**CNS:** *Dizziness, anxiety,* somnolence, ataxia, confusion, *asthenia,* unsteady gait, depression, suicidal ideation, seizures, tremor, hostility, EEG changes
**CV:** Vasodilatation, tachycardia, hypertension

**ENDO:** Goiter, hypothyroidism
**GI:** Nausea, diarrhea, vomiting, increased appetite
**INTEG:** Pruritus, rash, Stevens-Johnson syndrome, alopecia, hyperhidrosis
**MS:** Myalgia
**RESP:** Pharyngitis, coughing

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | >95% |
| **Distribution** | Protein binding 96% |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | 7-9 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 45 min |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

CarBAMazepine, PHENobarbital, phenytoin, primidone: decreased effect of these products
Sevelamer: decreased tiagabine effect
Valproate: lower dose of tiaGABine may be required

### Drug classifications

Alcohol, CNS depressants: increased CNS depression

### Drug/food

High-fat meal: decreased rate of absorption

## NURSING CONSIDERATIONS

### Assessment

- Monitor renal function tests: urinalysis, BUN, urine creatinine q3mo
- Monitor liver function tests: ALT, AST, bilirubin
- **Assess description of seizures:** location, duration, presence of aura; assess for weakness
- Withdraw gradually to prevent seizures
- May cause status epilepticus and unexplained death
- **Assess mental status:** mood, sensorium, affect, behavioral changes, suicidal thoughts; if mental status changes, notify prescriber, increased affect and hypomania may be present
- **Beers:** Avoid in older adults, unless safer alternatives are not available, may cause ataxia, impaired psychomotor function

### Patient/family education

- Advise patient to carry/wear emergency ID stating patient's name, products taken, condition, prescriber's name and phone number
- Advise patient to avoid driving, other activities that require alertness
- Teach patient not to discontinue medication quickly after long-term use
- Teach patient to notify prescriber if pregnancy is planned or suspected, avoid breastfeeding
- Teach patient to report suicidal thoughts, behaviors immediately

### Evaluation

**Positive therapeutic outcome**

- Decreased seizure activity; document on patient's chart

**⚠ HIGH ALERT**

## ticagrelor

(tye-ka'gre-lor)
**Brilinta**
*Func. class.:* Platelet inhibitor
*Chem. class.:* ADP receptor antagonist

**Do not confuse:** Brilinta/Brintellix

**ACTION:** Reversibly binds to the platelet receptor, preventing platelet activation

**Therapeutic outcome:** Prevention of thromboembolism

**USES:** Arterial thromboembolism prophylaxis in acute coronary syndrome (ACS) (unstable angina, acute MI), including in patients undergoing percutaneous coronary intervention (PCI)

## CONTRAINDICATIONS

Hypersensitivity, severe hepatic disease, bleeding

**Precautions:** Abrupt discontinuation, breastfeeding, children, infants, neonates, GI bleeding, hepatic disease, pregnancy C

**BLACK BOX WARNING:** Bleeding, intracranial bleeding

**BLACK BOX WARNING:** Coronary artery bypass graft (CABG) surgery, abrupt discontinuation, aspirin coadministration

## DOSAGE AND ROUTES

**Adult: PO** Loading dose 180 mg with aspirin (usually 325 mg PO); then, give 90 mg bid with aspirin 75-100 mg/day, do not give maintenance doses of aspirin >100 mg/day

**Available forms:** Tab 90 mg

### Implementation

**PO route**

- May be taken without regard to food
- Store at room temperature, in original container in dry place

• Discontinue 5-7 days before surgery
• May be crushed (90-mg tab) and mixed with purified water, 100 ml (PO), 50 ml (NG); ensure entire dose is given by flushing mortar, syringe, NG tube with 2 additional 50 ml of water

## ADVERSE EFFECTS

**CNS:** Dizziness, fatigue, headache
**CV:** Atrial fibrillation, bradyarrhythmias, chest pain, hypertension, hypotension, syncope, ventricular pauses
**GI:** Diarrhea, nausea
**HEMA:** Fatal bleeding
**MISC:** Back pain, gynecomastia, hyperuricemia
**RESP:** Cough, dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 36% |
| **Distribution** | Protein binding >99% |
| **Metabolism** | By CYP3A4 |
| **Excretion** | 26% (urine) |
| **Half-life** | 7 hr; 9 hr metabolite |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1.5 hr (product), 2.5 hr (metabolite) |
| **Duration** | ≥8 hr |

## INTERACTIONS

### Individual drugs

Simvastatin, lovastatin: increased effect
Digoxin: change in effect

### Drug classifications

**BLACK BOX WARNING:** Anticoagulants, NSAIDs, platelet inhibitors: increased bleeding risk

CYP3A4 inducers (carBAMazepine, dexamethasone, PHENobarbital, phenytoin, rifampin): decreased ticagrelor action

**BLACK BOX WARNING:** CYP3A4 inhibitors (atazanavir, clarithromycin, dalfopristin, delavirdine, indinavir, isoniazid, itraconazole, ketoconazole, lopinavir, nefazodone, nelfinavir, quinupristin, ritonavir, saquinavir, telithromycin, tipranavir, voriconazole): increased bleeding risk

### Drug/lab

Serum creatinine: increased

## NURSING CONSIDERATIONS

### Assessment

• **Thromboembolism:** Monitor CBC differential with platelet count baseline and periodically during treatment

**BLACK BOX WARNING:** Assess for bleeding that may occur when aspirin is combined with this product, some bleeding can be fatal, usually aspirin doses >100 mg/day; watch for frank bleeding, hypotension, avoid use with active bleeding, history of intracranial bleeding

**BLACK BOX WARNING:** **CABG:** Do not use in those undergoing CABG; discontinue ≥5 days before surgery

**BLACK BOX WARNING:** Abrupt discontinuation: Do not discontinue abruptly, may increase risk for MI, stent thrombosis, death

**BLACK BOX WARNING:** **Aspirin coadministration:** Use with 75-100 mg of aspirin/day, avoid higher doses, ticagrelor efficiency is decreased with aspirin >100 mg/day

• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, may be fetal toxic, do not breastfeed, excretion unknown

### Patient/family education

• Teach patient to take only as prescribed, do not skip or double doses, if a dose is missed, take next dose at scheduled time

**BLACK BOX WARNING:** Advise patient to notify prescriber of chills, fever, bruising, bleeding; not to use aspirin ≥100 mg/day

• Teach patient not to use any Rx, OTC products, herbs without approval of prescriber; products with aspirin, NSAIDs may cause bleeding
• Instruct patient to notify all health care providers of product use
• Advise patient that product can be taken without regard to meals
• Teach patient it may take longer for bleeding to stop
• Teach patient not to breastfeed

**BLACK BOX WARNING:** Advise patient to notify prescriber if pregnancy is planned or suspected

### Evaluation

**Positive therapeutic outcome**
• Prevention of thromboembolism

**⚠ HIGH ALERT**

**RARELY USED**

## ticlopidine (Rx)

(tye-cloe′pi-deen)

*Func. class.:* Platelet aggregation inhibitor

*Chem. class.:* Thienopyridine compound

**ACTION:** Irreversible inhibition of platelet aggregation through antagonism of ADP

**Therapeutic outcome:** Decreased stroke by decreasing platelet aggregation

**USES:** Reducing the risk of stroke in high-risk patients

**Unlabeled uses:** Intermittent claudication, chronic arterial occlusion, subarachnoid hemorrhage, uremic patients with AV shunts/fistulas, open heart surgery, coronary artery bypass grafts, primary glomerulonephritis, diabetic neuropathy

## CONTRAINDICATIONS

Hypersensitivity, severe liver disease, active bleeding, coagulopathy

**BLACK BOX WARNING:** Agranulocytosis, neutropenia, thrombocytopenia, thrombotic thrombocytopenic purpura (TTP)

**Precautions:** Pregnancy, breastfeeding, children, geriatric, past liver disease, renal disease, increased bleeding risk, peptic ulcer disease, surgery

**BLACK BOX WARNING:** Anemia, hematological disease

## DOSAGE AND ROUTES

**Adult:** PO 250 mg bid with food

**Available forms:** Tabs 250 mg

### Implementation

• Give with food or after eating to decrease GI effects; may use methylPREDNISolone **IV** 20 mg to provide normal bleeding time in 2 hr

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, weakness

**EENT:** Tinnitus, epistaxis

**GI:** Nausea, vomiting, diarrhea, GI discomfort, cholestatic jaundice, hepatitis, increased cholesterol LDL, VLDL, triglycerides

**GU:** Hematuria

**HEMA:** Bleeding (epistaxis, hematuria, conjunctival hemorrhage, GI bleeding), agranulocytosis, neutropenia, thrombocytopenia, thrombotic thrombocytopenic purpura

**INTEG:** Rash, pruritus

**META:** Hypercholesterolemia, hypertriglyceridemia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Liver, extensively; 98% protein binding |
| **Excretion** | Kidneys, unchanged product |
| **Half-life** | Increased with repeat dosing; 4-5 days (multiple doses) |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-3 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Abciximab, aspirin, eptifibatide, tirofiban: increased bleeding tendencies

Ambrisenten, fosphenytoin, phenytoin, theophylline: increased levels of each specific drug

Cimetidine: increased effects of ticlopidine

CycloSPORINE: decreased plasma levels of cycloSPORINE

Digoxin: decreased plasma levels of digoxin

### Drug classifications

Antacids: decreased plasma levels of ticlopidine

Anticoagulants, NSAIDs, salicylates, SSRIs, thrombin inhibitors, thrombolytics: increased bleeding risk

CYP2C19, CYP2DC substrates: increased levels of each specific drug

### Drug/herb

Ginger, ginkgo, garlic, feverfew, horse chestnut, green tea: increased bleeding risk

## NURSING CONSIDERATIONS

### Assessment

• Monitor liver function tests: AST, ALT, bilirubin, creatinine if patient is on long-term therapy (4 mo or more)

**BLACK BOX WARNING:** Blood dyscrasias, bone marrow depression, do not use in those with a history of these conditions; monitor blood tests: CBC, Hct, Hgb, pro-time if patient is on long-term therapy; CBC q2wk × 3 mo therapy; thrombocytopenia, neutropenia may occur

**BLACK BOX WARNING:** Monitor bleeding time baseline and throughout therapy, levels may be 2-5 × normal limit

T

• **Beers:** Avoid in older adults, safer alternatives are available

### Patient/family education

• Advise patient that blood studies are necessary during treatment

**BLACK BOX WARNING:** Advise patient to report any unusual bleeding to prescriber

• Instruct patient to take with food or just after eating to minimize GI discomfort, not to double missed dose

• Caution patient to report side effects such as diarrhea, skin rashes, subcutaneous bleeding, signs of cholestasis (yellow skin and sclera, dark urine, light-colored stools)

• Advise patient that product should be discontinued 10-14 days before surgery

• Advise there are many drug and herb interactions; to avoid all OTC products unless approved by prescriber

• To take with food

### Evaluation

**Positive therapeutic outcome**

• Absence of stroke

## tigecycline (Rx)

(tye-ge-sye'kleen)

**Tygacil**

*Func. class.:* Broad-spectrum antiinfective

*Chem. class.:* Glycylcyclines

**ACTION:** Inhibits protein synthesis and phosphorylation in microorganisms; bacteriostatic, structurally similar to the tetracyclines

**Therapeutic outcome:** Resolution of infection

**USES:** Complicated skin/skin structure infections: *Escherichia coli, Enterococcus faecalis* (vancomycin-susceptible only), *Staphylococcus aureus, Streptococcus agalactiae, S. anginosus* group, *S. pyogenes, Bacteroides fragilis;* complicated intraabdominal infections *(Citrobacter freundii), Enterobacter cloacae, Escherichia coli, Klebsiella oxytoca, K. pneumoniae, E. faecalis* (vancomycin-susceptible only), *S. aureus* (methicillin-susceptible only), *S. anginosus* group, *B. fragilis, Bacteroides thetaiotaomicron, B. uniformis, B. vulgatus, Clostridium perfringens, Peptostreptococcus micros,* community-acquired pneumonia

## CONTRAINDICATIONS

Pregnancy, breastfeeding, children <18 yr, hypersensitivity to tigecycline

**Precautions:** Renal/hepatic disease, hypersensitivity to tetracyclines, ventricular-associated hospital-acquired pneumonias

**BLACK BOX WARNING:** Infection

## DOSAGE AND ROUTES

**Adult: IV** 100 mg, then 50 mg q12hr, **IV** INF is given over 30 min to 60 min q12hr; given for 5-14 days depending on infection

### Hepatic dose (Child-Pugh C)

**Adult:** IV 100 mg, then 25 mg q12hr

**Available forms:** Powder for inj, lyophilized 50 mg

### Implementation

• Tigecycline allergy test before using, obtain C&S, do not begin treatment before results

**Intermittent IV infusion route**

• Reconstitute each vial with 5.3 ml of 0.9% NaCl, or $D_5W$ (10 mg/ml); swirl to dissolve; immediately withdraw 5 ml of the reconstituted sol and add to a 100-ml **IV** bag for inf (1 mg/ml); may be yellow or orange, if not, sol should be discarded; do not give if particulate matter is present, use a dedicated IV line or Y-site, flush with NS before and after use, give over ½ hr

• Store in tight, light-resistant container at room temperature, diluted sol at room temp for up to 24 hr, 6 hr in vial, and remaining time in IV bag, 48 hr refrigerated

**Y-site compatibilities:** Acyclovir, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amphotericin B liposome, ampicillin, ampicillin/sulbactam, argatroban, azithromycin, aztreonam, bivalirudin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, carmustine, caspofungin, ceFAZolin, cefepime, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, cyclophosphamide, cycloSPORINE, cytarabine, dacarbazine, DACTINomycin, DAPTOmycin, DAUNOrubicin hydrochloride, dexamethasone, dexmedetomidine, dexrazoxane, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doripenem, DOXOrubicin hydrochloride, DOXOrubicin liposome, droperidol, enalaprilat, EPINEPHrine, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, foscarnet, fosphenytoin, furosemide, ganciclovir, gemcitabine, gentamicin, glycopyrrolate, granisetron, haloperidol, heparin, hydrocortisone,

HYDROmorphone, ifosfamide, imipenem/cilastatin, insulin, irinotecan, isoproterenol, ketorolac, labetalol, lansoprazole, lepirudin, leucovorin, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, meropenem, mesna, methohexital, methotrexate, methyldopa, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, mitoMYcin, mitoXANtrone, morphine, moxifloxacin, mycophenolate, nafcillin, nalbuphine, naloxone, nesiritide, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, pantoprazole, PEMEtrexed, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phenylephrine, piperacillin/tazobactam, potassium acetate/chloride/phosphate, procainamide, prochlorperazine, promethazine, propofol, propranolol, ranitidine, remifentanil, rocuronium, sodium acetate/bicarbonate/phosphate, streptozocin, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiopental, thiotepa, ticarcillin/clavulanate, tirofiban, tobramycin, topotecan, trimethoprim/sulfamethoxazole, vancomycin, vasopressin, vecuronium, vinBLAStine, vinCRIStine, vinorelbine, zidovudine, zoledronic acid

**Y-site incompatibilities:** Amiodarone, amphotericin B colloidal, bleomycin, chloramphenicol, chlorproMAZINE, dantrolene, DAUNOrubicin liposome, diazepam, epirubicin, hydrALAZINE, IDArubicin, niCARdipine, phenytoin, quinupristin/dalfopristin, verapamil

## ADVERSE EFFECTS

**CNS:** Headache, dizziness, insomnia
**CV:** Hypo/hypertension, phlebitis
**EENT:** Tooth discoloration
**GI:** *Nausea, vomiting, diarrhea,* anorexia, constipation, dyspepsia, hepatotoxicity, hepatic failure, pseudomembranous colitis
**HEMA:** Anemia, leukocytosis, thrombocytopenia
**INTEG:** *Rash,* pruritus, sweating, photosensitivity
**META:** Increased ALT, AST, BUN, lactic acid, alkaline phosphatase, amylase, hyperglycemia, hypokalemia, hypoproteinemia, bilirubinemia
**MISC:** Back pain, fever, abnormal healing, abdominal pain, abscess, asthenia, infection, pain, peripheral edema, local reactions
**RESP:** Cough, dyspnea
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 71%-89% |
| **Metabolism** | Not extensively |
| **Excretion** | 22% unchanged, urine; primarily biliarily excreted |
| **Half-life** | Terminal 42 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Warfarin: increased effect of tigecycline

### Drug classifications

Oral contraceptives: decreased effect of tigecycline

### Drug/lab test

Increased: amylase, LFTs, alk phos, BUN, creatinine, LDH, WBC, INR, PTT, PT
Decreased: potassium, calcium, sodium, Hgb/Hct, platelets

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Increased mortality risk: Use only with confirmed or strongly suspected bacterial infection; do not use as a prophylactic

- **Pseudomembranous colitis:** assess for diarrhea, abdominal pain, fever, fatigue, anorexia; possible anemia, elevated WBC, low serum albumin; stop product and usually give either vancomycin or IV metroNIDAZOLE
- Assess for signs of anemia: Hct, Hgb, fatigue
- Monitor blood tests: PT, CBC, AST, ALT, BUN creatinine
- **Assess for allergic reactions:** rash, itching, pruritus, angioedema, serious allergic skin reactions: assess for Stevens-Johnson syndrome, anaphylaxis
- Assess for nausea, vomiting, diarrhea; administer antiemetic, antacids as ordered
- **Assess for overgrowth of infection:** fever, malaise, redness, pain, swelling, drainage, perineal itching, diarrhea, changes in cough or sputum
- **Toxicity:** assess for pseudotumor cerebri, photosensitivity, anti-anabolic actions (azotemia, BUN, hypophosphatemia, metabolic acidosis): tigecycline is structurally similar to tetracycline
- **Assess for pancreatitis, hyperamylasemia:** may be fatal; if these occur, discontinue; improvement usually occurs after product is discontinued

T

• **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding, may cause fetal harm

### Patient/family education

• Teach patient to avoid sun exposure; sunscreen does not seem to decrease photosensitivity
• Teach patient to avoid pregnancy while taking this product; fetal harm may occur; to avoid breastfeeding
• Teach patient to report burning, pain at inj site
• Teach patient to report diarrhea, fatigue, abdominal pain, severe nausea, vomiting

### Evaluation

**Positive therapeutic outcome**
• Decreased temp, absence of lesions, negative C&S

**⚠ HIGH ALERT**

## timolol (Rx)

(tye'moe-lole)
**Apo-Timol, Novo-Timol**
*Func. class.:* Antihypertensive; antiglaucoma
*Chem. class.:* Nonselective β-blocker

**ACTION:** Competitively blocks stimulation of β-adrenergic receptor within vascular smooth muscle (decreases rate of SA node discharge, increases recovery time), slows conduction of AV node, decreases heart rate, which decreases $O_2$ consumption in myocardium; also decreases renin-aldosterone-angiotensin system; at high doses inhibits $\beta_2$ receptors in bronchial system

**Therapeutic outcome:** Decreased B/P, decreased arrhythmias, absence of death from MI, decreased aqueous humor in the eye, absence of migraine headaches

**USES:** Mild to moderate hypertension, migraine prophylaxis, to decrease mortality following MI

**Unlabeled uses:** Tremors, angina pectoris

## CONTRAINDICATIONS

Hypersensitivity to β-blockers, cardiogenic shock, heart block (2nd or 3rd degree), sinus bradycardia, HF, cardiac failure, severe COPD, asthma

**Precautions:** Pregnancy, breastfeeding, major surgery, diabetes mellitus, thyroid/renal/hepatic disease, COPD, well-compensated heart failure, nonallergic bronchospasm, peripheral vascular disease

**BLACK BOX WARNING:** Abrupt discontinuation

## DOSAGE AND ROUTES

### Hypertension

**Adult:** PO 10 mg bid, or 20 mg/day, may increase by 10 mg q7day, max 60 mg/day
**Geriatric:** PO Initiate dose cautiously

### Myocardial infarction

**Adult:** 10 mg bid beginning 1-4 wk after MI for ≥2 yr

### Glaucoma

**Adult:** Ophth 1 gtt daily or bid
**Child:** Ophth 1 gtt daily or bid (0.25% SOL only)

### Migraine headache prevention

**Adult:** PO 10 mg bid, or 20 mg/day; may increase to 30 mg/day, 20 mg in AM, 10 mg in PM; discontinue if not effective after 8 wk

**Available forms:** Tabs 5, 10, 20 mg

### Implementation

• Given before meals, at bedtime; tab may be crushed or swallowed whole; give with food to prevent GI upset; reduce dosage in renal dysfunction
• Store at room temp; do not freeze

## ADVERSE EFFECTS

**CNS:** *Insomnia, dizziness,* hallucinations, anxiety, fatigue, depression, headache
**CV:** Hypotension, bradycardia, HF, edema, chest pain, claudication, angina, AV block, ventricular dysrhythmias
**EENT:** *Vision changes,* sore throat, *double vision,* dry burning eyes
**GI:** *Nausea,* vomiting, ischemic colitis, diarrhea, *abdominal pain,* mesenteric arterial thrombosis, flatulence, constipation
**GU:** Impotence, urinary frequency
**HEMA:** Agranulocytosis, thrombocytopenia, purpura
**INTEG:** Rash, alopecia, pruritus, fever
**META:** Hypoglycemia
**MUSC:** *Joint pain, muscle pain*
**RESP:** Bronchospasm, dyspnea, cough, crackles, nasal stuffiness

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO), minimally absorbed (ophth) |
| **Distribution** | Protein binding <10% |
| **Metabolism** | Liver, extensively |
| **Excretion** | Breast milk |
| **Half-life** | 3 hr |

### Pharmacodynamics

| | PO |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-4 hr |
| **Duration** | 12-24 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased hypotension, bradycardia (large amounts)
HydrALAZINE, methyldopa, prazosin, reserpine: increased hypotension, bradycardia
Insulin: decreased hypoglycemia
Thyroid hormones: decreased antihypertensive effect

### Drug classifications

Anticholinergics, nitrates: increased hypotension, increased bradycardia
$\beta_2$-Adrenergic agonists: increased β-blocking effect
Calcium channel blockers: increased effects of calcium channel blockers
NSAIDs, salicylates, sympathomimetics: decreased antihypertensive effect
Sulfonylureas: decreased hypoglycemic effect
Theophyllines: decreased bronchodilatation

### Drug/lab test

Increased: renal, liver function tests, uric acid
Interference: glucose, insulin tolerance test

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Abrupt discontinuation:** may result in myocardial ischemia, MI, severe hypotension, ventricular dysrhythmias in those with preexisting cardiovascular disease

- Assess for headaches: location, severity, duration, frequency baseline, throughout treatment
- Monitor B/P during beginning treatment, periodically thereafter; pulse q4hr; note rate, rhythm, quality: apical/radial pulse before administration; notify prescriber of any significant changes (pulse <50 bpm)
- Check baselines in renal, liver function tests before therapy begins
- Assess for edema in feet, legs daily, monitor I&O ratio, daily weight; check for jugular vein distention, crackles bilaterally, dyspnea (HF)
- Monitor skin turgor, dryness of mucous membranes for hydration status, especially geriatric
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed, excreted in breast milk

### Patient/family education

**BLACK BOX WARNING:** Teach patient not to discontinue product abruptly; taper over 2 wk; may precipitate angina if stopped abruptly

- Advise patient not to use OTC products containing α-adrenergic stimulants (nasal decongestants, cold preparations); to avoid alcohol, smoking; to limit sodium intake as prescribed
- Teach patient how to take pulse and B/P at home; advise patient when to notify prescriber
- Instruct patient to comply with weight control, dietary adjustments, modified exercise program
- Advise patient to carry/wear emergency ID to identify product being taken, any allergies; tell patient product controls symptoms but does not cure
- Caution patient to avoid hazardous activities if dizziness, drowsiness are present
- Teach patient to report symptoms of HF; difficult breathing, especially on exertion or when lying down; night cough; swelling of extremities or bradycardia; dizziness; confusion; depression; fever
- Teach patient to take product as prescribed, not to double dose, skip doses; take any missed doses as soon as remembered if at least 4 hr until next dose
- Product masks hypoglycemia; monitor blood sugar

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P in hypertension (after 1-2 wk)
- Absence of dysrhythmias

## TREATMENT OF OVERDOSE:

Lavage, **IV** atropine for bradycardia, **IV** theophylline for bronchospasm, digoxin, $O_2$, diuretic for cardiac failure, hemodialysis, **IV** glucose for hyperglycemia, **IV** diazepam (or phenytoin) for seizures



## timolol ophthalmic

*See Appendix B*

**⚠ HIGH ALERT**

## tinidazole (Rx)

(tye-ni′da-zole)
**Tindamax**
*Func. class.:* Antiprotozoal
*Chem. class.:* Nitroimidazole derivative

**ACTION:** Interferes with DNA/RNA synthesis in protozoa

**Therapeutic outcome:** Decrease in infection

**USES:** Amebiasis, giardiasis, trichomoniasis

## CONTRAINDICATIONS

Breastfeeding, hypersensitivity to this product or nitroimidazole derivative, pregnancy

**Precautions:** Pregnancy, children, geriatric, hepatic disease, CNS depression, blood dyscrasias, candidiasis, seizures, viral infection, alcoholism

**BLACK BOX WARNING:** Secondary malignancy

## DOSAGE AND ROUTES

### Intestinal amebiasis

**Adult:** PO 2 g/day × 3 days
**Adolescent/child ≥3 yr:** PO 50 mg/kg/day × 3 days, max 2 g/day

### Amebic involvement (liver)

**Adult:** PO 2 g/day × 3-5 days
**Child ≥3 yr:** PO 50 mg/kg/day × 3-5 days, max 2 g

### Giardiasis

**Adult:** PO 2 g as a single dose
**Child ≥3 yr:** PO 50 mg/kg as a single dose, max 2 g

### Trichomoniasis

**Adult:** PO 2 g as a single dose

### Bacterial vaginosis

**Adult (not pregnant):** PO 2 g/day × 2 days with food or 1 g/day × 5 days with food

### Available forms:

Tabs 250, 500 mg

### Implementation

- Administer to those >3 yr old
- Give with food; tabs can be crushed and mixed with artificial cherry syrup

## ADVERSE EFFECTS

**CNS:** *Dizziness, headache,* seizures, *peripheral neuropathy,* malaise, fatigue
**GI:** *Nausea, vomiting,* anorexia, increased AST and ALT, constipation, abdominal pain, indigestion, altered taste
**HEMA:** Leukopenia, neutropenia
**INTEG:** Pruritus, urticaria, *rash,* oral candidiasis
**SYST:** Angioedema, cramping

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Crosses blood-brain barrier |
| **Metabolism** | Extensively in the liver |
| **Excretion** | Unchanged (20%-25%) in urine, (12%) feces |
| **Half-life** | 12-14 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Do not use within 2 wk of taking disulfiram
Cholestyramine, oxytetracycline: decreased action of tinidazole
CycloSPORINE, fluorouracil, lithium, tacrolimus: increased action

### Drug classifications

Anticoagulants, hydantoins: increased action
CYP3A4 inducers (phenobarbital, phenytoin, rifampin): decreased action of tinidazole
CYP3A4 inhibitors (cimetidine, ketoconazole): increased action of tinidazole

### Drug/herb

St. John's wort: increased or decreased tinidazole level

### Drug/lab test

Increase: triglycerides, LDH, AST/ALT, glucose
Decrease: WBCs

## NURSING CONSIDERATIONS

### Assessment

- Giardiasis: obtain 3 stool samples several days apart beginning q3-4wk after treatment
- **Assess for amebic liver abscess:** monitor CBC, ESR, amebic gel diffusion test, ultrasound, total and differential leukocyte count
- Assess for signs of infection, anemia
- Assess bowel pattern before, during treatment

**BLACK BOX WARNING: Secondary malignancy:** Avoid unnecessary use

- **Pregnancy/breastfeeding:** Contraindicated during first trimester, do not breastfeed

### Patient/family education

- Instruct patient to take with food to increase plasma concentrations, minimize epigastric distress and other GI effects; not to use alcoholic beverages during or for 3 days afterward
- **Trichomoniasis:** Advise patient that all, partners should be notified and treated at the same time
- Teach patient to avoid alcohol, may cause disulfiram reaction
- Teach patient to avoid doing hazardous activities until reaction is known
- Teach patient that product causes taste change
- Teach patient not to use OTC, Rx or herbal products unless approved by prescriber

### Evaluation

#### Positive therapeutic outcome

- Decrease in infection as evidenced by negative culture

## tioconazole vaginal antifungal

*See Appendix B*

## tiotropium (Rx)

(ty-oh'tro-pee-um)

**HandiHaler, Spiriva, Spiriva Respimat**

*Func. class.:* Anticholinergic, bronchodilator

*Chem. class.:* Synthetic quaternary ammonium compound

**Do not confuse:** Spiriva/Inspra/Apidra

**ACTION:** Inhibits interaction of acetylcholine at receptor sites on the bronchial smooth muscle, resulting in decreased cGMP and bronchodilatation

**Therapeutic outcome:** Improved breathing

**USES:** COPD, for long-term treatment, once daily maintenance of bronchospasm, associated with COPD including chronic bronchitis and emphysema

## CONTRAINDICATIONS

Hypersensitivity to this product, atropine, or its derivatives

**Precautions:** Pregnancy, breastfeeding, children, geriatric, closed-angle glaucoma, prostatic hypertrophy, bladder neck obstruction, renal disease

## DOSAGE AND ROUTES

**Adult:** INH content of 1 cap/day (18 mcg) using HandiHaler inhalation device or 2 inh (spray) (2.5 mcg each) qday

**Available forms:** Powder for inhalation 18 mcg in blister packs containing 6 caps with inhaler; 30 caps with inhaler; spray inhaler (Respimat) 2.5 mcg/spray

### Implementation

**Inhalation route**

- Caps are for INH only; do not swallow
- Immediately before administration, peel back foil until cap is visible (until "stop" line); open dust cap of HandiHaler by pulling upward, then open mouthpiece
- Place cap in center chamber; firmly close mouthpiece until it clicks, leaving dust cap open
- Hold HandiHaler with mouthpiece upward; press button in once, completely, and release; this allows medication to be released
- Breathe out completely; do not breathe into mouthpiece at any time
- Raise device to mouth and close lips tightly around mouthpiece
- With head upright, breathe in slowly/deeply, but allowing the cap to vibrate; breathe until lungs fill; hold breath and remove mouthpiece; resume normal breathing
- Repeat
- Remove used capsule and discard; close the mouthpiece and dust cap; store

**Inhalation route (spray)**

- Insert cartridge into inhaler; prime inhaler; must reprime once if not used for >3 days; if not used for >21 days, prime until aerosol is visible and 3 more times

## ADVERSE EFFECTS

**CNS:** Depression, paresthesia
**CV:** Chest pain, increased heart rate
**EENT:** Dry mouth, blurred vision, glaucoma
**GI:** *Vomiting,* abdominal pain, constipation, dyspepsia
**GU:** Urinary difficulty, urinary retention, UTI
**INTEG:** Rash, angioedema
**MISC:** Candidiasis, flulike syndrome, herpes zoster, infections, angina pectoris
**MS:** Arthritis, myalgic leg/skeletal pain
**RESP:** *Cough, worsening of symptoms,* sinusitis, URI, epistaxis, pharyngitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Does not cross blood-brain barrier |
| **Metabolism** | Very little metabolized in the liver |
| **Excretion** | Excreted in urine, 72% protein binding |
| **Half-life** | 5-6 days in animals |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Drug classifications

Anticholinergics: avoid use with other anticholinergics

### Drug/lab test

Increased: cholesterol, glucose

## NURSING CONSIDERATIONS

### Assessment

- For tolerance over long-term therapy; dose may have to be increased or changed
- **Respiratory status:** assess for dyspnea, rate, breath sounds before and during treatment; pulmonary function tests baseline and periodically; upper respiratory infection, cough, sinusitis
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in

T

breastfeeding, unlikely to cause harm in the infant

### Patient/family education

- Teach patient how to use HandiHaler
- Teach patient signs of closed-angle glaucoma (eye pain, blurred vision, visual halos)
- Advise patient that product is used for long-term maintenance, not for immediate relief of breathing problems
- Caution patient to avoid getting the powder in the eyes; may cause blurred vision and pupil dilatation
- Teach patient to hold hand/haler with mouthpiece upward; to press button in once, completely; and release; this allows for medication to be released
- Teach patient to breathe out completely; not to breathe into mouthpiece at any time
- Teach patient to raise device to mouth and close lips tightly around mouthpiece
- Teach patient to rinse mouth after use; to use hard candy or regular oral hygiene to reduce dry mouth
- With head upright, to breathe in slowly and deeply, but allow the cap to vibrate; to breathe until the lungs fill; to hold breathe and remove mouthpiece; to resume normal breathing
- Teach patient to report immediately blurred vision, eye pain, halos
- Teach patient to keep caps in sealed blisters before use, store at room temperature

### Evaluation

**Positive therapeutic outcome**

- Ability to breathe easier

## tipranavir (Rx)

(ti-pran'a-veer)

**Aptivus**

*Func. class.:* Antiretroviral

*Chem. class.:* Protease inhibitor

**ACTION:** Inhibits HIV protease; this prevents the maturation of virus

**Therapeutic outcome:** Prevention of worsening of HIV

**USES:** HIV in combination with other antiretrovirals

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, renal disease, history of renal stones, sulfa allergy, hemophilia, diabetes mellitus, pancreatitis, alcoholism, immune reconstitution syndrome, surgery, trauma, infection

**BLACK BOX WARNING:** Intracranial bleeding, hepatitis, hepatic disease (Child-Pugh B to C)

## DOSAGE AND ROUTES

Reduce dosage in mild or moderate hepatic impairment and ketoconazole coadministration

**Adult:** PO 500 mg coadministered with ritonavir 200 mg bid with food

**Adolescent and child ≥2 yr:** PO 14 mg/kg given with ritonavir 6 mg/kg bid or 375 mg/m$^2$ given with ritonavir 150 mg/m$^2$ bid; max 500 mg with ritonavir 200 mg bid

**Available forms:** Caps 250 mg

### Implementation

- Not to be used in those who are treatment naive
- Swallow cap whole; do not break, crush, or chew
- Store caps in refrigerator before use; after opening, store at room temp; use within 60 days
- Give after meals
- Give in equal intervals around the clock to maintain blood levels

## ADVERSE EFFECTS

**CNS:** *Headache, insomnia,* dizziness, somnolence, fatigue, *fever,* intracranial bleeding

**GI:** *Diarrhea, abdominal pain, nausea, vomiting,* anorexia, dry mouth, hepatitis B or C, fatalities when given with ritonavir, pancreatitis

**GU:** Nephrolithiasis

**INTEG:** *Rash,* urticaria, lipodystrophy, serious rash

**MS:** Pain

**OTHER:** Asthenia, insulin-resistant hyperglycemia, *hyperlipidemia,* ketoacidosis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding, 99.9%, steady state 7-10 days |
| **Metabolism** | CYP3A4 |
| **Excretion** | 80% feces |
| **Half-life** | Terminal 6 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 3 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

- Amiodarone, astemizole, cisapride, flecainide, midazolam, pimozide, propafenone, quiNIDine, rifabutin, rifampin, terfenadine, triazolam: life-threatening dysrhythmias

Clarithromycin, zidovudine: increased levels of both products
Delavirdine, itraconazole, ketoconazole: increased tipranavir levels
Efavirenz, fluconazole, nevirapine: decreased tipranavir levels
Lovastatin, simvastatin: increased myopathy, rhabdomyolysis

### Drug classifications

• **Ergots:** life-threatening dysrhythmias
Oral contraceptives: increased levels of tipranavir
Rifamycins: decreased tipranavir levels

### Drug/herb

St. John's wort: decreased tipranavir levels; avoid concurrent use

### Drug/food

Grapefruit juice, high-fat, high-protein foods: decreased tipranavir absorption

### Drug/lab test

Increased: AST, ALT, cholesterol, blood glucose, amylase, lipase, triglycerides

## NURSING CONSIDERATIONS

### Assessment

• Assess for signs of infection, anemia, the presence of other STDs

**BLACK BOX WARNING: Hepatitis/pancreatitis:** ALT, AST; total bilirubin, amylase, all may be elevated, discontinue in those with hepatic insufficiency or hepatitis or AST/ALT 10× upper limit or AST/ALT 5-10× ULN and total bilirubin 2.5× ULN; assess for anorexia, nausea, jaundice, hepatomegaly, clay-colored stools

• **HIV:** Monitor viral load, CD4, plasma HIV RNA, serum cholesterol/triglycerides during treatment
• Monitor bowel pattern before, during treatment; if severe abdominal pain with bleeding occurs, product should be discontinued; monitor hydration
• **Immune reconstitution syndrome:** has been reported with combination antiretroviral therapy; patients may develop pain (MAC, CMV, PcP, TB) and autoimmune disease months after treatment

**BLACK BOX WARNING: Intracranial bleeding:** more common in those with trauma or surgery, or those taking antiplatelets or anticoagulants; assess for headache, nausea, vomiting, seizures, confusion, inability to speak; can be fatal

• **Cushingoid symptoms:** assess for buffalo hump, facial/peripheral wasting, breast enlargement, central obesity
• **Serious rash:** if a serious rash occurs, product should be discontinued
• Assess for allergies before treatment, reaction of each medication; place allergies on chart
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, enroll pregnant patient in the Antiretroviral Pregnancy Registry 800-258-4263, do not breastfeed

### Patient/family education

• Teach patient to take as prescribed; if dose is missed, take as soon as remembered up to 1 hr before next dose; do not double dose, that this product must be taken with other antiretrovirals
• Teach patient that product must be taken in equal intervals around the clock to maintain blood levels for duration of therapy
• Advise that hyperglycemia may occur; watch for increased thirst, weight loss, hunger, dry, itchy skin; notify prescriber
• Advise patient that product does not cure AIDS, only controls symptoms; not to donate blood
• Teach patient not to breastfeed
• Advise patient that redistribution of body fat may occur
• Teach patient not to use with other products unless approved by prescriber, many drug interactions
• Inform patient that product must be taken in combination with ritonavir
• Teach patient to stop product and notify prescriber if anorexia, nausea, vomiting, yellowing of skin or eyes, clay-colored stools, fatigue, pain in upper abdomen occur

### Evaluation

**Positive therapeutic outcome**
• Prevention of viral replication

**⚠ HIGH ALERT**

## tirofiban (Rx)

(tie-roh-fee'ban)
**Aggrastat**
*Func. class.:* Antiplatelet
*Chem. class.:* Glycoprotein IIb/IIIa inhibitor

**Do not confuse:** Aggrastat/argatroban

**ACTION:** Antagonist of platelet glycoprotein (GP) IIb/IIIa receptor that leads to binding of fibrinogen and von Willebrand's factor, which inhibits platelet aggregation

**Therapeutic outcome:** Decreased platelet count

## USES: Acute coronary syndrome in combination with heparin

## CONTRAINDICATIONS

Hypersensitivity, active internal bleeding, stroke, major surgery, severe trauma within 30 days, intracranial neoplasm, aneurysm, hemorrhage, acute pericarditis, platelets $<100{,}000/mm^3$, history of thrombocytopenia, coagulopathy, systolic B/P >180 mm Hg or diastolic B/P >110 mm Hg

**Precautions:** Pregnancy, breastfeeding, children, geriatric, renal disease, bleeding tendencies, hypertension, platelets $<150{,}000/mm^3$

## DOSAGE AND ROUTES

**Adult: IV** 0.4 mcg/kg/min × 30 min, then 0.1 mcg/kg/min for 12-24 hr after angioplasty or atherectomy

### Renal dose

**Adult:** IV CCr <30 ml/min 0.2 mcg/kg/min × 30 min, then 0.05 mcg/kg/min, during angiography and for up to 12-24 hr after angioplasty

**Available forms:** Inj 50 ml vials; inj premixed bag 50 mcg/ml in 100, 250 ml

### Implementation

#### Intermittent IV infusion route

- Discontinue no less than 2-4 hrs before CABG
- Dilute inj: withdraw and discard 100 ml from a 500-ml bag of sterile 0.9% NaCl or $D_5$ and replace this vol with 100 ml of tirofiban inj from two vials
- Tirofiban inj for sol is premixed in containers of 500 ml 0.9% NaCl (50 mg/ml), give over 30 min
- Minimize other arterial/venous punctures, IM inj, catheter use, intubation to reduce bleeding risks
- Do not use if particulates are present
- Discard unused solution after 24 hr from start of infusion

**Y-site compatibilities:** Acyclovir, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amiodarone, ampicillin, ampicillin/sulbactam, anidulafungin, argatroban, arsenic trioxide, atracurium, atropine, azithromycin, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, capreomycin, CARBOplatin, carmustine, caspofungin, ceFAZolin, cefepime, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, dexrazoxane, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doxacurium, DOXOrubicin, DOXOrubicin liposome, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, foscarnet, fosphenytoin, furosemide, ganciclovir, gemcitabine, gentamicin, glycopyrrolate, granisetron, haloperidol, heparin, hydrALAZINE, hydrocortisone, HYDROmorphone, IDArubicin, ifosfamide, imipenem/cilastatin, insulin, irinotecan, isoproterenol, ketorolac, labetalol, leucovorin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, meropenem, mesna, methylhexital, methotrexate, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, mitoXANtrone, morphine, mycophenolate, nafcillin, nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pamidronate, pancuronium, pantoprazole, PEMEtrexed, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, piperacillin/tazobactam, potassium acetate/chloride/phosphates, procainamide, prochlorperazine, promethazine, propranolol, quinupristin/dalfopristin, ranitidine, remifentanil, rocuronium, sodium acetate/bicarbonate, streptozocin, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiopental, thiotepa, ticarcillin/clavulanate, tigecycline, tobramycin, topotecan, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

**Y-site incompatibilities:** Amphotericin B colloidal, amphotericin B liposome, dantrolene, diazepam, phenytoin

## ADVERSE EFFECTS

**CNS:** Dizziness, headache
**CV:** Bradycardia, hypotension
**GI:** Nausea, vomiting
**HEMA:** Bleeding, thrombocytopenia
**INTEG:** *Rash*
**MISC:** Dissection, edema, pain in legs/pelvis, sweating
**SYST:** Anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Plasma clearance 20%-25% |
| **Metabolism** | Liver |
| **Excretion** | Urine/feces |
| **Half-life** | 2 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Abciximab, aspirin, cefamandole, cefoperazone, cefoTEtan, clopidogrel, dipyridamole, eptifibatide, heparin, ticlopidine, valproic acid: increased bleeding risk

### Drug classifications

Heparins, NSAIDs, SNRIs, SSRIs, thrombin inhibitors: increased bleeding risk

Increase: Tirofiban clearance: levothyroxine, omeprazole

### Drug/lab

Decrease: Platelets, Hct, Hgb

## NURSING CONSIDERATIONS

### Assessment

- **Bleeding:** Monitor platelet counts, Hct, Hgb before treatment, within 6 hr of loading dose and at least daily thereafter; watch for bleeding from puncture sites, catheters, or in stools, urine
- Assess for contraindications to therapy; recent major surgery, active bleeding trauma within 30 days
- **Pregnancy/breastfeeding:** Do not use unless clearly needed, do not breastfeed, excretion unknown

### Patient/family education

- Advise patient that it is necessary to quit smoking to prevent excessive vasoconstriction
- Teach signs/symptoms of bleeding, low platelets
- Advise that there are many drug and herb interactions, do not use unless approved by prescriber

### Evaluation

**Positive therapeutic outcome**

- Treatment of acute coronary syndrome

## tiZANidine (Rx)

(tye-za′na-deen)

**Zanaflex**

*Func. class.:* Skeletal muscle relaxant, central acting

*Chem. class.:* Imidazole

**Do not confuse:** tiZANidine/tiaGABine

**ACTION:** Increases presynaptic inhibition of motor neurons and reduces spasticity by $\alpha_2$-adrenergic agonism

**Therapeutic outcome:** Decreased pain/spasticity in multiple sclerosis

**USES:** Acute/intermittent management of increased muscle tone associated with spasticity, symptoms of MS

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, geriatric, renal/hepatic disease, hypotension

## DOSAGE AND ROUTES

**Adult:** PO 8 mg q6-8hr; max 36 mg/24 hr

### Renal dose

**Adult:** PO CCr <25 ml/min, start with lower dosage

**Available forms:** Tabs 2, 4 mg; caps 2, 4, 6 mg

### Implementation

- Store in airtight container at room temperature
- Give consistently either with or without food; food may affect absorption
- Titrate dose carefully
- Avoid use with other CNS depressants
- Caps, tabs are equivalent if used on empty stomach

## ADVERSE EFFECTS

**CNS:** *Dizziness,* somnolence, speech disorder, dyskinesia, nervousness, hallucination, psychosis

**CV:** Hypotension, bradycardia

**GI:** *Constipation, vomiting, dry mouth,* increased ALT, abnormal liver function tests

**GU:** Urinary frequency

**OTHER:** Blurred vision, pharyngitis, rhinitis, tremor, rash, muscle weakness

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Completely absorbed |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys, feces |
| **Half-life** | 2½ hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-2 hr |
| **Duration** | 3-6 hr |

T

## INTERACTIONS

### Individual drugs

Acyclovir, alcohol, amiodarone, ciprofloxacin, enoxacin, famotidine, fluvoxaMINE, norfloxacin, propafenone, tacrine, verapamil, zileuton: increased tizanidine levels; avoid concurrent use

Acetaminophen: Decreased acetaminophen absorption, monitor effect

Rasagiline: increased effect of rasagiline

### Drug classifications

Antihypertensive: increased hypotension

CNS depressants, opioids: increased CNS depression, do not use together unless absolutely needed

### Drug/herb

Kava, St. John's wort: increased CNS depression

### Drug/lab test

Increased: AST, alkaline phosphatase, ALT, serum glucose

## NURSING CONSIDERATIONS

### Assessment

- Assess for muscle spasticity baseline and throughout treatment
- Monitor B/P, heart rate
- Perform neurologic exam in spasticity: deep tendon reflexes, muscle tone, clonus, sensory function
- Monitor renal/liver function tests, electrolytes, CBC with differential during long-term treatment
- Assess for allergic reactions: rash, fever, respiratory distress; severe weakness, numbness in extremities
- Assess CNS depression: dizziness, drowsiness, psychiatric symptoms
- Check dosage, because individual titration is required
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, no well-controlled studies, caution use in breastfeeding, excretion unknown
- **Beers:** Avoid in older men, may cause urinary retention

### Patient/family education

- Advise patient not to discontinue medication quickly; spasticity will occur; product should be tapered off over 1-2 wk
- Advise patient not to take with alcohol, other CNS depressants; take as directed; if dose is missed, take as soon as remembered, unless it is almost time for next dose
- Caution patient to avoid altering activities while taking this product; to avoid hazardous activities if drowsiness or dizziness occurs; to rise from sitting or lying slowly to prevent fainting
- Teach patient to use gum, frequent sips of water for dry mouth
- Advise patient to avoid using OTC medications (cough preparations, antihistamines) unless directed by prescriber
- Notify prescriber if fainting, hallucinations, dark urine, stomach pain, yellowing of skin/eyes occurs
- Advise patient to rise slowly from lying or sitting to upright position to prevent orthostatic hypotension
- Teach patient to avoid hazardous activities until reaction is known
- Teach patient not to use other products unless approved by prescriber, avoid use with other CNS depressants, opioids, if adverse reactions occur, seek medical assistance
- Teach patient to use gum, lozenges for dry mouth
- Advise patient to report immediately vision changes, hallucinations
- Teach patient to always take either with or without food consistently, effects may be altered if taking differently

### Evaluation

**Positive therapeutic outcome**

- Decreased pain, spasticity

## tobramycin (Rx)

(toe-bra-mye'sin)

**Aktob, Bethkis, Kitabis, TOBI, TOBI Podhaler**

*Func. class.:* Antiinfective

*Chem. class.:* Aminoglycoside

**ACTION:** Interferes with protein synthesis in bacterial cell by binding to ribosomal subunit, causing inaccurate peptide sequence to form in protein chain, causing bacterial death

**Therapeutic outcome:** Bactericidal effects for the following organisms: *Pseudomonas aeruginosa, Enterobacter, Escherichia coli, Providencia, Citrobacter, Staphylococcus, Proteus, Klebsiella, Serratia*

**USES:** Severe systemic infections of CNS, respiratory, GI, urinary tract, bone, skin, soft tissues, cystic fibrosis (nebulizer), *Acinetobacter calcoaceticus, Citrobacter, Enterobacter, Enterococcus, Escherichia coli, Haemophilus aegyptius, Haemophilus influenzae* (beta-lactamase negative), *Haemophilus influenzae* (beta-lactamase positive), *Klebsiella, Moraxella lacunata, Morganella morganii, Neisseria, Proteus mirabilis, Proteus vulgaris, Providencia, Pseudomonas aeruginosa, Serratia,*

*Staphylococcus aureus* (MSSA), *Staphylococcus epidermidis, Staphylococcus, Streptococcus;* **may also be used for the following:** *Acinetobacter, Aeromonas, Bacillus anthracis, Salmonella, Shigella*

## CONTRAINDICATIONS

Hypersensitivity to aminoglycosides

**BLACK BOX WARNING:** Pregnancy, severe renal disease

**Precautions:** Breastfeeding, geriatric, neonates, mild renal disease, myasthenia gravis, Parkinson's disease

**BLACK BOX WARNING:** Hearing deficits, neuromuscular disease

## DOSAGE AND ROUTES

**Adult:** IM/**IV** 3 mg/kg/day in divided doses q8hr; may give up to 6 mg/kg/day in divided doses q8-12hr; once-daily dosing (pulse dosing) (unlabeled) **IV** 5-7 mg/kg; dosing intervals are determined using a nomogram and are based on random levels drawn 8-12 hr after first dose

**Child:** IM/**IV** 6-7.5 mg/kg/day in 3-4 equal divided doses

**Neonate <1 wk:** IM/**IV** ≤4 mg/kg/day divided q12hr

Conventional dosing: Multiply the serum creatinine (mg/100 ml) by 6 to determine the dosing; to decrease the dose, divide the standard dose by the serum creatinine (mg/100 ml) to determine the lower recommended dose

Interval adjustment of extended-interval dosing of 5 or 7 mg/kg (unlabeled): Adjust doses based on serum concentrations and organism MIC; CCr 40-59 ml/min: 5 or 7 mg/kg IV q36hr; CCr 20-39 ml/min: 5 or 7 mg/kg IV q48hr; CCr <20 ml/min: 5 or 7 mg/kg IV once, then follow serial levels to determine time of next dose (serum concentration <1 mcg/ml)

**Dose adjustment of extended dosing of 5 mg/kg (unlabeled):** Adjust doses based on serum concentrations and organism MIC; CCr >80 ml/min: no dosage adjustment is needed; CCr 60-79 ml/min: 4 mg/kg **IV** q24hr; CCr 50 ml/min: 3.5 mg/kg **IV** q24hr CrCl 40 ml/min: 2.5 mg/kg **IV** q24hr; CrCl <30 ml/min: Use traditional dosing

### Cystic fibrosis with *Pseudomonas aeruginosa*

**Child 6 yr:** NEB 300 mg bid in repeating cycles of 28 days on/28 days off; give inh over 10-15 min using a hand-held PARI LC PLUS reusable nebulizer with a DeVilbiss Pulmo-Aid compressor

**Available forms:** Inj 10, 40 mg/ml; powder for inj 1.2 g; neb sol 300 mg/5 ml; powder for inh 28 mg

### Implementation

**IM route**

- Give inj deeply in large muscle mass, aspirate
- Draw peak 1 hr after dose, trough right before next dose; absorption erratic

**Nebulizer route**

- The solution for nebulization is for inhalation only; use over 10-15 min

**Inhalation route (TOBI Podhaler)**

- Use with Podhaler device, do not swallow caps, use device for 7 days then discard
- Keep caps in blister pack until ready to use, administer other inhaled products or chest physiotherapy before
- While holding base of Podhaler device, unscrew lid, stand upright, unscrew mouthpiece; while holding body, tear blister card in half lengthwise along precut lines; peel back foil, place cap in chamber at top of device, reattach mouthpiece, and tighten; with mouthpiece pointed down, press blue button down with thumb, release; exhale completely, place mouth over mouthpiece, close lips, inhale with single breath, hold 5 sec, and exhale normally away from device; after a few normal breaths, repeat, unscrew mouthpiece, and remove cap: cap should be empty; repeat process 3 more times (total 4 caps); after use reattach mouthpiece and wipe with clean, dry cloth

**Intermittent IV infusion route**

- Visually inspect solution; do not use if discolored or if particulate is present
- ADD-Vantage vials are for IV only and only for exactly 60 or 80 mg
- Give **IV** diluted in 50-100 ml of 0.9% NaCl, $D_{10}W$, $D_5$/0.9% NaCl, 0.9% NaCl, Ringer's, LR, $D_5W$ (adult), inf over 20-60 min, volume for pediatric patients needs and should be sufficient to allow for 20-60 min infusion
- Flush after inf with $D_5W$, 0.9% NaCl
- Separate aminoglycosides and penicillins by ≥1 hr

**Y-site compatibilities:** Acyclovir, aldesleukin, alfentanil, alprostadil, amifostine, aminophylline, amiodarone, amsacrine, anidulafungin, ascorbic acid, atracurium, atropine, aztreonam, bivalirudin, bretylium, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, chloramphenicol, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexmedetomidine, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel,

DOPamine, doripenem, doxacurium, DOXOrubicin hydrochloride, DOXOrubicin liposome, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, epoetin alfa, ertapenem, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, fluorouracil, foscarnet, furosemide, gemcitabine, gentamicin, glycopyrrolate, granisetron, HYDROmorphone, ifosfamide, imipenem/cilastatin, isoproterenol, ketorolac, labetalol, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, metaraminol, methicillin, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, miconazole, midazolam, milrinone, minocycline, mitoXANtrone, morphine, moxalactam, multiple vitamins, nafcillin, nalbuphine, naloxone, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pantoprazole, papaverine, penicillin G, pentazocine, perphenazine, PHENobarbital, phentolamine, phenylephrine, phytonadione, potassium chloride, procainamide, prochlorperazine, promethazine, propranolol, protamine, pyridoxine, quinupristin/dalfopristin, ranitidine, remifentanil, riTUXimab, rocuronium, sodium acetate/bicarbonate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, thiotepa, ticarcillin/clavulanate, tigecycline, tirofiban, tolazoline, trastuzumab, trimetaphan, urokinase, vancomycin, vasopressin, vecuronium, verapamil, vinCRISTine, vinorelbine, voriconazole, zidovudine

**Y-site incompatibilities:** Allopurinol, amphotericin B cholesteryl, amphotericin B colloidal, amphotericin B liposome, azaTHIOprine, azithromycin, ceFAZolin, cefoperazone, cefoTEtan, cefTRIAXone, dantrolene, dexamethasone, diazepam, diazoxide, drotrecogin, folic acid, ganciclovir, heparin, indomethacin, oxacillin, PEMEtrexed, pentamidine, PENTobarbital, phenytoin, piperacillin/tazobactam, propofol, sargramostim, trimethoprim/sulfamethoxazole

## ADVERSE EFFECTS

**CNS:** Confusion, depression, numbness, tremors, seizures, muscle twitching, neurotoxicity, dizziness, vertigo

**CV:** Hypo/hypertension, palpitations

**EENT:** *Ototoxicity,* deafness, visual disturbances, tinnitus

**GI:** *Nausea, vomiting, anorexia,* increased ALT, AST, bilirubin, hepatomegaly, hepatic necrosis, splenomegaly

**GU:** Oliguria, hematuria, renal damage, azotemia, renal failure, nephrotoxicity

**HEMA:** Agranulocytosis, thrombocytopenia, leukopenia, eosinophilia, anemia

**INTEG:** *Rash,* burning, urticaria, dermatitis, alopecia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (IM), completely absorbed (**IV**) |
| **Distribution** | Widely distributed in extracellular fluids |
| **Metabolism** | Minimal liver |
| **Excretion** | Mostly unchanged (>90%) kidneys |
| **Half-life** | 2-3 hr, increased in renal disease, neonates |

### Pharmacodynamics

| | IM | IV | OPHTH |
|---|---|---|---|
| **Onset** | Rapid | Rapid | Rapid |
| **Peak** | 1 hr | Inf end | Unknown |
| **Duration** | Unknown | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

Acyclovir, amphotericin B, bacitracin, cidofovir, CISplatin, ethacrynic acid, furosemide, mannitol, methoxyflurane, polymyxin, vancomycin: increased ototoxicity, neurotoxicity, nephrotoxicity

### Drug classifications

**BLACK BOX WARNING: Aminoglycosides,** cephalosporins, penicillins: increased otoxicity, neurotoxicity, nephrotoxicity

## NURSING CONSIDERATIONS

### Assessment

- Assess patient for previous sensitivity reaction

**Systemic route**

- Assess patient for signs and symptoms of infection including characteristics of wounds, sputum, urine, stool, WBC >10,000/mm$^3$, temp baseline, during treatment
- Complete C&S testing before beginning product therapy to identify if correct treatment has been initiated
- Assess for allergic reactions: rash, urticaria, pruritus, chills, fever, joint pain

**BLACK BOX WARNING: Renal disease:** Identify urine output; if decreasing, notify prescriber (may indicate nephrotoxicity); also, obtain BUN, creatinine, urine CCr (<80 ml/min) values; urinalysis daily for proteinuria, cells, casts; report sudden change in urine output

**BLACK BOX WARNING: Pregnancy:** identify if pregnancy is planned or suspected; do not use in pregnancy, breastfeeding

**BLACK BOX WARNING:** Serum aminoglycoside concentration: Serum peak drawn at 30-60 min after IV infusion or 60 min after IM inj; trough drawn just before next dose, peak 4-10 mcg/ml, trough 0.5-2 mcg/ml, increased level may lead to serious toxicity

**BLACK BOX WARNING:** Deafness by audiometric testing; ringing, roaring in ears; vertigo; assess hearing before, during, after treatment

- Monitor blood studies: AST, ALT, CBC, Hct, bilirubin, LDH, alkaline phosphatase, Coombs' test monthly if patient is on long-term therapy
- Monitor electrolytes: potassium, sodium, chloride, magnesium monthly if patient is on long-term therapy
- Monitor for bleeding: ecchymosis, bleeding gums, hematuria, stool guaiac daily if patient is on long-term therapy
- **Assess for overgrowth of infection:** perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum
- Obtain weight before treatment; calculation of dosage is usually based on ideal body weight but may be calculated on actual body weight
- Monitor VS during inf, watch for hypotension, change in pulse
- Assess **IV** site for thrombophlebitis including pain, redness, swelling q30min; change site if needed; apply warm compresses to discontinued site

**BLACK BOX WARNING:** Obtain serum peak, drawn at 30-60 min after **IV** inf or 60 min after IM inj, trough level drawn just before next dose; peak 4-12 mcg/ml, trough 1-2 mcg/ml, increased level may lead to serious toxicity

**BLACK BOX WARNING: Monitor for deafness by audiometric testing,** ringing, roaring in ears, vertigo; assess hearing before, during, after treatment, promptly

### Patient/family education

- Teach patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)
- Advise patient to contact prescriber if vaginal itching, loose foul-smelling stools, furry tongue occur; may indicate superinfection

**BLACK BOX WARNING:** Advise patient to notify prescriber if pregnancy is planned or suspected, not to use in pregnancy, breastfeeding

- Advise patient to notify prescriber of diarrhea with blood or pus; may indicate pseudomembranous colitis
- Teach patient to avoid hazardous activities until response is known

**Nebulizer route**

- Advise patient to use multiple therapies first, then tobramycin, not to use if cloudy or contains particulates

### Evaluation

**Positive therapeutic outcome**

- Absence of signs/symptoms of infection (WBC $<10{,}000/mm^3$, temp WNL, absence of red, draining wounds)
- Reported improvement in symptoms of infection

**TREATMENT OF OVERDOSE:** Withdraw product, hemodialysis, exchange transfusion in the newborn, monitor serum levels of product, may give ticarcillin or carbenicillin

## tobramycin ophthalmic

*See Appendix B*

## tocilizumab (Rx)

(toe'si-liz'oo-mab)

**Actemra**

*Func. class.:* DMARDs (Disease modifying anti-rheumatoid drugs)/tumor necrosis factor (TNF) modifier

**ACTION:** Interleukin- 6 (IL-6) receptor inhibiting monoclonal antibody

**Therapeutic outcome:** Ability to move more easily with less pain

**USES:** Rheumatoid arthritis, active systemic juvenile idiopathic arthritis

**CONTRAINDICATIONS**

Hypersensitivity

**Precautions:** Breastfeeding, pregnancy, risk for GI perforation, active hepatic disease, severe neutropenia/thrombocytopenia, demyelinating disorders

**BLACK BOX WARNING:** Invasive fungal infection, active TB

## DOSAGE AND ROUTES

### Monotherapy with or without methotrexate or other DMARDs, moderate-severe rheumatoid arthritis

**Adult: IV** 4 mg/kg over 1 hr q4wk, may increase to 8 mg/kg q4wk based on clinical response, max dose 800 mg/inf; do not initiate if ANC is >2000 and platelets are <100,000/mm$^3$.

### Juvenile idiopathic arthritis

**Child ≥2 yr/adolescent ≥30 kg: IV** 8 mg/kg over 1 hr q2wk

**Child ≥2 yr/adolescent <30 kg: IV** 10 mg/kg over 1 hr q2wk

### Therapeutic drug monitoring

**Before initiation of treatment:** Check the ANC, platelet count, and liver function tests (ALT/AST concentrations) before use. In adults, it is not recommended for those with an ANC, 2000/mm$^3$, a platelet count < 00,000/mm$^3$, or ALT or AST 1.5 × ULN

**Dosage modifications for adult patients with rheumatoid arthritis or giant cell arteritis**

**Absolute neutrophil count (ANC) 500 to 1,000 cells/mm$^3$:** Hold and restart when ANC >1000 cells/mm$^3$ with IV dosing at 4 mg/kg with an increase to 8 mg/kg as clinically appropriate or SUBCUT every other week with an increase to weekly as appropriate

**Absolute neutrophil count (ANC) less than 500 cells/mm$^3$:** Discontinue

**Platelet count 50,000 to 100,000 cells/mm$^3$:** Hold and restart when platelet count >100,000/mm$^3$ with IV dosing at 4 mg/kg with an increase to 8 mg/kg as appropriate or SUBCUT every other week with an increase to weekly as appropriate

**Platelet count less than 50,000 cells/mm$^3$:** Discontinue

**Hepatic enzyme abnormalities:** May need to interrupt or modify based on the degree of AST/ALT elevations above the upper limit of normal (ULN)

**Pediatric patients:** Dose interruptions are needed for low neutrophil counts and low platelet counts in patients with SJIA or PJIA at levels similar to what is outlined for adult patients with rheumatoid arthritis. If appropriate, concomitant methotrexate and/or other medications should be dose modified or stopped and tocilizumab dosing interrupted until the situation has been evaluated. In SJIA and PJIA, base the decision to discontinue tocilizumab due to a laboratory abnormality upon the medical assessment of the individual

### Maximum dosage limits

**Adult**

**Rheumatoid arthritis, weight more than 100 kg:** 800 mg/dose IV and 162 mg/dose SUBCUT

**Rheumatoid arthritis and giant cell arteritis, weight 100 kg or less:** 8 mg/kg/dose IV and 162 mg/dose SUBCUT

**Cytokine release syndrome (CRS), weight 30 kg or more:** 800 mg/dose IV

**CRS, weight less than 30 kg:** 12 mg/kg IV

**Geriatric**

**Rheumatoid arthritis, weight more than 100 kg:** 800 mg/dose IV and 162 mg/dose SUBCUT

**Rheumatoid arthritis and giant cell arteritis, weight 100 kg or less:** 8 mg/kg/dose IV and 162 mg/dose SUBCUT

**Cytokine release syndrome (CRS), 30 kg or more:** 800 mg/dose IV

**CRS, less than 30 kg:** 12 mg/kg IV

**Adolescent**

**Weight 30 kg or more:** 8 mg/kg/dose IV

**Weight less than 30 kg:** 12 mg/kg/dose IV for systemic juvenile idiopathic arthritis and cytokine release syndrome (CRS); 10 mg/kg/dose IV for polyarticular juvenile idiopathic arthritis

**Child**

**2 years and older and weight 30 kg or more:** 8 mg/kg/dose IV

**2 years and older and weight less than 30 kg:** 12 mg/kg/dose IV for systemic juvenile idiopathic arthritis and cytokine release syndrome (CRS); 10 mg/kg/dose IV for polyarticular juvenile idiopathic arthritis

**Less than 2 years:** Safe and effective use has not been established

**Infant**

Safe and effective use has not been established

### Patients with hepatic impairment dosing

**Adult patients with rheumatoid arthritis or giant cell arteritis with hepatic impairment**

**Before initiating treatment:** Do not initiate treatment with tocilizumab if baseline AST/ALT is more than 1.5 times the upper limit of normal (ULN). However, patients with severe or life-threatening cytokine release syndrome (CRS) frequently have elevated ALT or AST; the decision to administer tocilizumab should take into account the potential benefit of treating the CRS versus the risks of short-term treatment with tocilizumab

**Hepatic enzyme elevations occurring during treatment:**

AST and/or ALT from 1 to 3 times the ULN: Dose-modify concomitant DMARDs, if appropriate. For persistent increases of transaminases in this range, reduce IV tocilizumab dose to 4 mg/kg or reduce subcutaneous dosing interval to every other week, or interrupt tocilizumab dosing until AST/ALT have normalized. For subcutaneous dosing, once ALT/AST have normalized, resume at every-other-week dosing and increase to once weekly as clinically appropriate

AST and/or ALT greater than 3 times and up to 5 times the ULN, confirmed by repeat testing: Interrupt tocilizumab dosing until AST/ALT is less than 3 times the ULN. Then, if appropriate, dose-modify concomitant DMARDs. For persistent increases of transaminases 3 times the ULN or less, reduce IV tocilizumab dose to 4 mg/kg, or reduce subcutaneous dosing interval to every other week, or interrupt tocilizumab until AST/ALT have normalized. For subcutaneous dosing, once ALT/AST have normalized, resume at every-other-week dosing and increase to once weekly as clinically appropriate. For persistent increases more than 3 times the ULN, discontinue tocilizumab

AST and/or ALT greater than 5 times the ULN: Discontinue tocilizumab

**Pediatric patients**

Tocilizumab dose reduction has not been studied in the systemic juvenile idiopathic arthritis (SJIA) or polyarticular juvenile idiopathic arthritis (PJIA) population. Tocilizumab dose interruptions are recommended for liver enzyme abnormalities in patients with SJIA or PJIA at levels similar to what is outlined for adult patients with rheumatoid arthritis. If appropriate, concomitant methotrexate and/or other medications should be dose-modified or stopped and tocilizumab dosing interrupted until the clinical situation has been evaluated. In SJIA and PJIA, base the decision to discontinue tocilizumab upon the medical assessment of the individual patient and the laboratory abnormality involved.

**Available forms:** Sol for inj 80 mg/4 ml, 200 mg/10 ml, 400 mg/20 ml

### Polyarticular juvenile idiopathic arthritis (PJIA) monotherapy/ combination with methotrexate

**Child ≥ 2 yr and ≥ 30 kg IV infusion:** 8 mg/kg over 1 hr, q4wk Child ≥ 2 yr and <30 kg: IV infusion 10 mg/kg over 1 hr q4wk

## Implementation

**SUBCUT route**

- Remove syringe from the refrigerator and allow to warm for 30 min at room temperature. Do not warm in any other way
- Use injection site such as the front of a thigh, outer area of an upper arm, or the abdomen except for the 2-inch area around the navel. Do not inject into moles, scars, or areas where the skin is tender, bruised, red, hard, or not intact. Rotate injection sites with each injection. Inject at >1 inch from the last area injected
- Remove the needle cap immediately before injection, and gently pinch a cleaned area of skin. Using a dartlike motion, insert the needle at a 45- or 90-degree angle to the skin. Release the pinched skin, and gently push the plunger all the way down to inject the full amount in the prefilled syringe (0.9 ml), which provides 162 mg of product
- The prefilled syringe is single-use only, as it does not have a preservative
- Remove the needle from the skin while continuing to depress the plunger. After the needle is completely removed, release the plunger, which will allow the needle-shield to protect the needle. Do not rub the site

**Intermittent IV route**

- Visually inspect for particulate matter and discoloration before administration should be colorless to pale yellow liquid
- From a 100-ml infusion bag or bottle, withdraw a volume of 0.9% NaCl for inj equal to the volume of the tocilizumab solution required for the patient's dose
- Slowly add tocilizumab from each vial into the infusion bag or bottle. Gently invert the bag to avoid foaming. Fully diluted solutions are compatible with polypropylene, polyethylene, and polyvinyl chloride infusion bags and polypropylene, polyethylene, and glass infusion bottles
- The fully diluted sol for inf may be stored refrigerated or at room temp for up to 24 hours and should be protected from light. Do not use unused product remaining in vials; no preservatives
- Allow the fully diluted solution to reach room temp before infusing
- Give over 60 min with an infusion set. Do not administer as an **IV** push or bolus
- Do not infuse concomitantly in the same intravenous line with other drugs

## ADVERSE EFFECTS

**CNS:** Headache, dizziness
**CV:** Hypertension

**GI:** Perforation, abdominal pain, gastritis, mouth ulcerations
**HEMA:** Neutropenia, thrombocytopenia
**INTEG:** Rash, infusion reactions
**RESP:** Upper respiratory infections, nasopharyngitis, bronchitis
**SYST:** Serious infections, anaphylaxis, infusion-related reactions, anti-tocilizumab antibody formation, secondary malignancy

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | ~6 days with a single dose and ~11 days with multiple (steady state) doses |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

CycloSPORINE, theophylline, warfarin: decreased product level

### Drug classifications

CYP3A4 substrates (hormonal contraceptives, omeprazole, atorvastatin, simvastatin): decreased levels of these products
Live virus vaccines: Do not use together
TNF modifiers, DMARDs, immunosuppressives: avoid use due to increased risk of infection

## NURSING CONSIDERATIONS

### Assessment

- **Rheumatoid arthritis:** assess ROM, pain, stiffness baseline q1-2wk
- Monitor blood studies: CBC with differential, LFTs, platelet count, serum lipid profile, baseline and periodically

**BLACK BOX WARNING:** Infection: Before treatment and periodically; obtain TB screening before beginning treatment, invasive fungal infections; discontinue if infection occurs during administration; may use antituberculosis therapy before tocilizumab in past history of latent or active TB when adequate course of treatment cannot be confirmed and those with a negative TB with risk factors for infections

- Secondary malignancy: Assess for malignancy periodically
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, pregnant patients should enroll in the Mother To Baby Autoimmune Disease Pregnancy Registry, do not breastfeed, excretion unknown

### Patient/family education

- Teach patient that this treatment must continue unless safety or effectiveness is an issue; reason for use and expected result

**BLACK BOX WARNING:** Advise patient to avoid use of live vaccines, bring immunizations up to date before treatment

**BLACK BOX WARNING:** Instruct patient to report signs/symptoms of infection (including TB and Hepatitis B), invasive fungal infections, discontinue if infection occurs during administration; may use antituberculosis therapy prior to tocilizumab in past history of latent or active TB when adequate course of treatment cannot be confirmed and those with a negative TB with risk factors for infections, to avoid others with infections

- Teach patient to notify prescriber if pregnancy is planned or suspected, pregnancy (C); do not use if breastfeeding, consider using a nonhormonal contraceptive because contraception may be decreased
- **Secondary malignancy:** assess for malignancy periodically

### Evaluation

**Positive therapeutic outcome**

- Ability to move more easily with less pain

## tofacitinib

(toe'fa-sye'ti-nib)
**Xeljanz**
*Func. class.:* antirheumatic agent (disease modifying), immunomodulator/biologic DMARD
*Chem. class.:* Janus kinase inhibitor

**ACTION:** Affects the signaling pathway of Janus kinase

**Therapeutic outcome:** Decreased inflammation, pain in joints, decreased joint destruction

**USES:** Rheumatoid arthritis (moderately to severely active) in those who have taken methotrexate with inadequate response or intolerance

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, neonates, infants, children, geriatric patients, neoplastic disease, ulcerative colitis, neutropenia,

peptic ulcer disease, active infections, risk of lymphomas/leukemias, TB, posttransplant lymphoproliferative disorder (PTLD), kidney disease, diabetes mellitus, HIV, hypercholesterolemia, herpes virus infection reactivation, patients of Asian descent

**BLACK BOX WARNING:** Infection, secondary malignancy

## DOSAGE AND ROUTES

**Adult: PO** 5 mg/day with or without methotrexate or other nonbiologic DMARDs

**Available forms:** Tabs 5 mg

### Implementation

**PO route**

Give without regard to food

## ADVERSE EFFECTS

**CNS:** Headache, paresthesias, insomnia, fatigue
**CV:** Hypertension
**GI:** Abdominal pain, nausea, liver damage, dyspepsia, vomiting, diarrhea, gastritis, GI perforation, steatosis
**HEMA:** Anemia, lymphocytosis, lymphopenia, neutropenia
**INTEG:** Rash, pruritus
**MISC:** Increased cancer risk, risk of infection (TB, invasive fungal infections, other opportunistic infections), may be fatal, posttransplant lymphoproliferative disorder (PTLD)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Bioavailability 70% |
| **Distribution** | Protein binding 40% (albumin) |
| **Metabolism** | Mediated by CYP3A4 |
| **Excretion** | Unknown |
| **Half-life** | 3 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 0.5–1 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

**BLACK BOX WARNING:** Do not use with TNF modifiers, vaccines, potent immunosuppressants, other biologic DMARDS, serious infection may occur

CYP3A4 inhibitors (amprenavir, boceprevir, delavirdine, ketoconazole, indinavir, itraconazole, dalfopristin/quinupristin, ritonavir, tipranavir, fluconazole, isoniazid, miconazole): increased tofacitinib effect

CYP3A4 inducers (rifampin, rifapentine, rifabutin, primidone, phenytoin, PHENobarbital, nevirapine, nafcillin, modafinil, griseofulvin, etravirine, efavirenz, barbiturates, bexarotene, bosentan, carBAMazepine, enzalutamide, dexamethasone): decreased tofacitinib effect

### Drug/lab test

Increase: LFTs, cholesterol
Decrease: neutrophils, lymphocytes, Hct, Hgb

## NURSING CONSIDERATIONS

### Assessment

- Monitor lipid profile, Hct/Hgb WBC, LFTs
- RA: assess for pain, stiffness, ROM, swelling of joints before, during treatment

**BLACK BOX WARNING: Active infection, including localized infection:** evaluate and test patients for latent or active TB before use; treat with antimycobacterials before use of product; this product increases the risk of serious illness including fatal infections (pulmonary or extrapulmonary TB; invasive fungal infections; and bacterial, viral, and opportunistic infections); during and after use, monitor for infection including TB in those who tested negative for latent TB before use; if a serious infection develops, interrupt receipt until the infection is controlled, reactivation or viral infections is higher in those of Asian descent

**BLACK BOX WARNING: Secondary malignancy:** lymphoma and other malignancies have been noted with product use

- **Epstein–Barr virus–associated post transplant lymphoproliferative disorder (PTLD):** in kidney transplant patients when used with this product and immunosuppressives
- **Liver disease**: not recommended in severe liver disease, impairment; dose modification is needed with moderate liver impairment, monitor LFTs
- **GI perforation:** assess in those with diverticulitis, peptic ulcer disease, or ulcerative colitis

**BLACK BOX WARNING:** Immunosuppression: obtain neutrophil and lymphocyte counts before use, do not start the product in lymphocyte count $< 500$ cells/mm$^3$ or $<$ ANC 1000 cells/mm$^3$; for ANC $>1000$ cells/mm$^3$, monitor neutrophil counts after 4-8 wk and every 3 mo thereafter; lymphocyte count $> 500$ cells/ mm$^3$, monitor lymphocyte counts every 3 mo

T

- **Anemia:** determine Hgb, do not start in Hgb 9 g/dl; in Hgb 9 g/dl, monitor Hgb after 4-8 wk and every 3 mo thereafter
- **Pregnancy (C)/breastfeeding:** use during pregnancy only if the potential benefit justifies the potential risk to the fetus; if pregnancy occurs, enrollment in the pregnancy registry is encouraged by calling 877–311–8972; discontinue product or breastfeeding, serious adverse reactions can occur in nursing infants

**BLACK BOX WARNING: Neoplastic disease** (lymphomas/leukemias)

### Patient/family education

- Teach patient not to have vaccines while taking this product
- Advise patient not to take any live virus vaccines during treatment, vaccinations should be brought up to date before starting treatment
- Inform patient to report signs of infection, allergic reaction
- **Pregnancy:** teach patient to report if pregnancy is planned or suspected, do not breastfeed

### Evaluation

**Positive therapeutic outcome**

- Decreased inflammation, pain in joints, decreased joint destruction

## tolcapone (Rx)

(toll′cah-pone)

**Tasmar**

*Func. class.:* Antiparkinson agent

*Chem. class.:* Catecholamine inhibitor (COMT)

**ACTION:** Selective, reversible inhibitor of catecholamine; used as adjunct to levodopa/carbidopa therapy

**Therapeutic outcome:** Increased ability to move and speak

**USES:** Parkinsonism

## CONTRAINDICATIONS

Hypersensitivity, rhabdomyolysis

**Precautions:** Pregnancy, breastfeeding, cardiac/renal disease, hypertension, asthma, history of rhabdomyolysis, hepatic disease

## DOSAGE AND ROUTES

**Adult:** PO 100-200 mg tid, with levodopa/carbidopa therapy; max 600 mg/day; discontinue if no benefit in 3 wk

**Available forms:** Tabs 100, 200 mg

### Implementation

- Administer tid with levodopa/carbidopa therapy
- Provide assistance with ambulation during beginning therapy
- Give without regard to food

## ADVERSE EFFECTS

**CNS:** Dystonia, dyskinesia, dreaming, *fatigue, headache, confusion,* psychosis, hallucination, dizziness, sleep disorders

**CV:** *Orthostatic hypotension,* chest pain, hypotension

**EENT:** Cataract, eye inflammation

**GI:** *Nausea, vomiting, abdominal distress,* diarrhea, constipation, fatal liver failure, elevated liver function tests

**GU:** UTI, urine discoloration, uterine tumor, micturition disorder, hematuria

**HEMA:** Hemolytic anemia, leukopenia, agranulocytosis

**INTEG:** Sweating, alopecia

**MS:** Rhabdomyolysis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Protein binding 99% |
| **Metabolism** | Liver, extensively |
| **Excretion** | Urine (60%), feces (40%) |
| **Half-life** | 2-3 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Apomorphine, DOBUTamine, isoproterenol, α-methyldopa: may influence pharmacokinetics

### Drug classifications

CNS depressants: increased CNS depression

MAOIs: decreased normal catecholamine metabolism; MAO-B inhibitor may be used

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Hepatic disease:** monitor liver function tests: AST, ALT, alkaline phosphatase, LDH, bilirubin, CBC; monitor ALT, AST q2wk x 1 yr, then q4wk x 6 mo, then q8wk thereafter; if LFTs are elevated product should not be used, if no improvement in 3 wk, discontinue, do not use in hepatic disease

- Assess involuntary movements in parkinsonism: akinesia, tremors, staggering gait, muscle rigidity, drooling

- Monitor B/P, respiration during initial treatment; hypo/hypertension should be reported
- Monitor mental status: affect, mood, behavioral changes, avoid use in those with dystonia

### Patient/family education

- Advise patient to change positions slowly to prevent orthostatic hypotension
- Advise patient that urine, sweat may change color
- Teach patient to notify prescriber if pregnancy is planned or suspected, pregnancy
- Teach patient that CNS changes may occur, hallucinations, involuntary movement
- Teach patient to avoid hazardous activities until reaction is known, dizziness occurs
- Teach patient to report poor impulse control, urges to gamble, spend wildly (rare)

**BLACK BOX WARNING:** Advise patient to report signs of hepatic injury: clay-colored stools, jaundice, fatigue, appetite loss, lethargy, fatigue, itching, right upper abdominal pain

- Teach patient to report nausea, vomiting, anorexia, diarrhea
- May be taken without regard to food

### Evaluation

**Positive therapeutic outcome**

- Decrease in akathisia, improved mood

## tolnaftate topical

*See Appendix B*

## tolterodine (Rx)

(tol-tehr′oh-deen)

**Detrol, Detrol LA**

*Func. class.:* Overactive bladder product

*Chem. class.:* Muscarinic receptor antagonist

**ACTION:** Relaxes smooth muscles in urinary tract by inhibiting acetylcholine at postganglionic sites

**Therapeutic outcome:** Decreased symptoms of overactive bladder

**USES:** Overactive bladder (frequency, urgency), urinary incontinence

## CONTRAINDICATIONS

Hypersensitivity, uncontrolled closed-angle glaucoma, urinary retention, gastric retention

**Precautions:** Pregnancy, breastfeeding, children, renal/hepatic disease, controlled closed-angle glaucoma, bladder obstruction, QT prolongation, decreased GI motility

## DOSAGE AND ROUTES

### Overactive bladder

**Adult and geriatric:** PO 2 mg bid, may decrease to 1 mg bid; EXT REL 4 mg/day, may decrease to 2 mg if needed, max 4 mg/day

### Hepatic disease

**Adult:** PO 1 mg bid (50% dose) or EXT REL 2 mg/day

### Renal dose

**Adult:** PO CCr ≤30 ml/min reduce by 50%

### CYP3A4 inhibitor dose

**Adult:** PO 1 mg bid; extended-release 2 mg qday if using with CYP3A4 inhibitor

**Available forms:** Tabs 1, 2 mg; ext rel caps 2, 4 mg

### Implementation

- Swallow whole; give with liquids

## ADVERSE EFFECTS

**CNS:** *Anxiety,* paresthesia, fatigue, *dizziness,* headache, increasing dementia, memory impairment

**CV:** Chest pain, hypertension, QT prolongation

**EENT:** Vision abnormalities, xerophthalmia

**GI:** *Nausea, vomiting, anorexia,* abdominal pain, constipation, dry mouth, dyspepsia

**GU:** Dysuria, retention, frequency, UTI

**INTEG:** Rash, pruritus

**RESP:** Bronchitis, cough, pharyngitis, upper respiratory tract infection

**SYST:** Angioedema, Stevens-Johnson syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Highly protein bound |
| **Metabolism** | Liver, extensively by CYP2D6, a portion of the population may be poor metabolizers |
| **Excretion** | Urine/feces |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Chloroquine, clarithromycin, droperidol, erythromycin, grepafloxacin, halofantrine, haloperidol, methadone, pentamidine: increased QT prolongation

Fesoterodine: do not use in those with known hypersensitivity

T

### Drug classifications
Antibiotics (macrolide), antifungal agents, antiretroviral protease inhibitors: increased action of tolterodine
Antimuscarinics: increased anticholinergic effect
β-agonists, class IA/III antidysrhythmics, local anesthetics, some phenothiazines, tricyclics: increased QT prolongation
Diuretics: increased urinary frequency

### Drug/food
Increased: bioavailability of tolterodine

### Drug/lab test
Increased: LFTs, bilirubin

## NURSING CONSIDERATIONS
### Assessment
- **Assess urinary patterns:** distention, nocturia, frequency, urgency, incontinence, residual urine
- **Serious skin disorders:** assess for angioedema, Stevens-Johnson syndrome; assess allergic reactions: rash; if this occurs, product should be discontinued
- **QT prolongation:** ECG for QT prolongation, ejection fraction; assess for chest pain, palpitations, dyspnea, may be compounded in those taking Class IA/III dysrythmics
- **Beers:** Avoid in older adults with or at high risk for delirium, monitor for confusion, delirium frequency

**BLACK BOX WARNING:** Fatal hepatic injury: increased LFTs, bilirubin during first 18 mo of therapy in those with autosomal dominant polycystic kidney disease; assess for fatigue, anorexia, right upper abdominal pain, dark urine, jaundice; if these occur, discontinue product and do not restart if cause is liver injury

- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, no well-controlled studies, do not breastfeed, excretion unknown

### Patient/family education
- Advise patient to avoid hazardous activities; dizziness may occur, shortness of breath, urinary retention
- Advise patient not to drink liquids before bedtime, to swallow extended-release product whole
- Teach patient importance of bladder maintenance
- Teach patient to take with liquids; swallow whole
- Notify prescriber if pregnancy is planned or suspected

### Evaluation
**Positive therapeutic outcome**
- Decreased urinary frequency, urgency

## tolvaptan (Rx)
(tole-vap'tan)
**Samsca**
*Func. class.:* Antihypertensive
*Chem. class.:* Vasopressin receptor antagonist, V2

**ACTION:** Arginine vasopressin (AVP) antagonist with affinity for $V_2$ receptors; level of circulating AVP in circulating blood is critical for regulation of water, electrolyte balance and is usually elevated in euvolemic/hypervolemic hyponatremia

**Therapeutic outcome:** Normal serum sodium level

**USES:** Hypervolemic/euvolemic hyponatremia in heart failure, cirrhosis, SIADH

## CONTRAINDICATIONS
Hypersensitivity, hypovolemia, anuria

**Precautions:** Pregnancy, breastfeeding, children, dehydration, geriatric patients, hyperkalemia, autosomal dominant PKD, malnutrition, alcoholism, hepatic disease

**BLACK BOX WARNING:** Osmotic demyelination syndrome, requires a specialized care setting

## DOSAGE AND ROUTES
**Adult:** PO 15 mg qd; after 24 hr, may increase to 30 mg qd; max 60 mg/day for ≤30 days

**Available forms:** Tab 15, 30 mg

### Implementation
- Give PO with or without food
- Avoid fluid restriction the first 24 hr
- Initiate in hospital setting
- Do not use with grapefruit or grapefruit juice

## ADVERSE EFFECTS
**CNS:** Fever, dizziness
**CV:** Ventricular fibrillation, DIC, stroke, thrombosis
**GI:** *Nausea,* vomiting, *constipation,* colitis, hepatic injury
**GU:** Polyuria
**HEMA:** Bleeding
**META:** *Dehydration, hyperglycemia,* hyperkalemia, hypernatremia
**MS:** Rhabdomyolysis
**RESP:** Respiratory depression, pulmonary embolism

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 99% |
| **Metabolism** | CYP3A4 |
| **Excretion** | Unknown |
| **Half-life** | Terminal 12 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

CYP3A4 inducers (carBAMazepine, dexamethasone, etravirine, flutamide, griseofulvin, metyrapone, modafinil, nafcillin, nevirapine, OXcarbazepine, phenytoin, rifampin, rifabutin, rifapentine, topiramate): decreased concentrations of tolvaptan

CYP3A4 inhibitors (efavirenz, fosamprenavir, quiNINE), P-gp inhibitors (azithromycin, cycloSPORINE, mefloquine, paliperidone, propafenone, quiNIDine, testosterone): increased concentrations of tolvaptan

### Drug/herb

St. John's wort: decreased tolvaptan effect

### Drug/food

Grapefruit/grapefruit juice: do not use together

## NURSING CONSIDERATIONS

### Assessment

- Assess renal, hepatic function

**BLACK BOX WARNING:** Osmotic demyelination syndrome, frequent sodium volume status; overly rapid correction of sodium concentration (>12 mEq/L per 24 hr) may occur in alcoholism, severe malnutrition, advanced liver disease, SIADH, correct sodium levels slowly, may result in dysarthria, mutism, dysphagia, coma, seizures, death

- Assess CV status: ventricular fibrillation, hypertension, monitor B/P, pulse
- Monitor electrolytes (sodium, potassium)

**BLACK BOX WARNING:** Specialized care setting needed so neurologic status, sodium levels can be monitored

- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed

### Patient/family education

- Teach patient to avoid pregnancy, breastfeeding while taking this product
- Advise of administration procedure and expected result
- Teach patient to report difficulty swallowing or speaking, seizures, dizziness, drowsiness: embolism may be the cause
- Teach patient to drink fluid in response to thirst
- Teach patient to not use grapefruit juice
- Teach patient to notify prescriber before using other products
- Teach patient to report upper-right abdominal pain, nausea, vomiting, anorexia, dark urine, yellowing of skin/eyes (hepatic injury)

### Evaluation

**Positive therapeutic outcome**

- Correction of serum sodium levels

## topiramate (Rx)

(toh-pire'a-mate)

**Topamax, Topamax Sprinkle, Trokendi XR, Qudexy XR**

*Func. class.:* Anticonvulsant—miscellaneous

*Chem. class.:* Monosaccharide derivative

**Do not confuse:** Topamax/Toprol XL

**ACTION:** Increased GABA activity; may prevent seizure spread as opposed to an elevation of seizure threshold

**Therapeutic outcome:** Absence of seizures

**USES:** Partial seizures in adults and children 2-16 yr old; tonic-clonic seizures; seizures in Lennox-Gastaut syndrome, migraine prophylaxis

**Unlabeled uses:** Infantile spasms, bulimia nervosa

## CONTRAINDICATIONS

Hypersensitivity, metabolic acidosis, pregnancy

**Precautions:** Breastfeeding, children, renal/hepatic disease, acute myopia, secondary closed-angle glaucoma, behavioral disorders, COPD, dialysis, encephalopathy, status asthmaticus, status epilepticus, surgery, paresthesias, maculopathy, nephrolithiasis

## DOSAGE AND ROUTES

### Adjunctive therapy

**Adult/adolescent/child ≥10 yr:** PO 25-50 mg/day initially, titrate by 25-50 mg/wk, up to 200-400 mg/day in 2 divided doses

**Adult/adolescent/child ≥10 yr:** PO (Qudexy XR, Trokendi XR) 50 mg qday; increase by 50 mg qwk during wk 2, 3, 4; increase by 100 mg qwk, wk 5, 6; final dose 400 mg qday

**Child 2-9 yr:** PO week 1 25 mg q PM, then 25 mg bid if tolerated (week 2), then increase by 25-50 mg/day each week as tolerated over 5-7 wk titration period, maintenance given in 2 divided doses; <11 kg minimum 150 mg/day, max 250 mg/day; 12-22 kg minimum 200 mg/day, max 300 mg/day; 23-31 kg minimum 200 mg, max 350 mg/day, 32-38 kg minimum 250 mg/kg, max 350 mg/day; >38 kg minimum 250 mg/day, max 400 mg/day; Qudexy XR 25 mg qday at night; may increase to 50 mg wk 2, if tolerated; increase by 25-50 mg each wk over 5-7 wk titration period; max dose based on weight

### Migraine prophylaxis

**Child ≤11 kg:** PO Qudexy XR minimum 150 mg daily, max 250 mg daily; 12-22 kg minimum 200 mg daily, max 300 mg daily; 23-31 kg minimum 200 mg daily, max 350 mg daily; 32-38 kg minimum 250 mg daily, max 350 mg daily; >38 kg minimum 250 mg daily, max 400 mg daily
**Adult:** PO 25 mg/day initially, increase by 25 mg/day qwk up to 100 mg/day in 2 divided doses

### Renal dose

**Adult:** PO CCr <70 ml/min ½ dose

**Available forms:** Tabs 25, 50, 100, 200 mg; sprinkle caps 15, 25 mg; ext rel caps 25, 50, 100, 200 mg; ext rel cap (sprinkles 24 hr) 25, 50, 100, 150, 200 mg

### Implementation

- Do not break, crush, or chew tabs; very bitter
- May take without regard to meals
- Sprinkle cap can be given whole or opened and sprinkled on soft food; do not chew, drink water after sprinkle
- Store at room temp away from heat, light

**Trokendi XR:** swallow whole; do not sprinkle on food, crush, chew; not recommended for child <6 yr
**Qudexy XR:** may swallow whole or sprinkle on food (teaspoon); swallow immediately; do not crush, chew

## ADVERSE EFFECTS

**CNS:** Dizziness, fatigue, cognitive disorder, *insomnia,* anxiety, depression, paresthesia, motor retardation, suicidal ideation, memory loss, tremor, poor balance, ataxia
**CV:** Flushing, chest pain
**EENT:** Diplopia, vision abnormality
**GI:** *Diarrhea, anorexia,* nausea, dyspepsia, abdominal pain, constipation, dry mouth, pancreatitis
**GU:** Breast pain, dysmenorrhea, menstrual disorder
**INTEG:** Rash, alopecia
**MISC:** Weight loss, leukopenia, metabolic acidosis, increased body temperature, unexplained death (epilepsy)
**RESP:** Upper respiratory tract infection, pharyngitis, sinusitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Crosses placenta, plasma protein binding (9%-17%), steady state 4 days |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys unchanged 55%-97% |
| **Half-life** | 19-25 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
Amitriptyline: increased effect of amitriptyline
CarBAMazepine, phenytoin, probenecid: decreased levels of topiramate
Digoxin: decreased levels of digoxin
Estrogen: decreased levels of estrogen
Hydrochlorothiazide, lamoTRIgine, metformin: increased topiramate levels
Lithium: decreased levels of lithium
RisperiDONE: decreased levels of risperidone
Valproic acid: decreased levels of both products

### Drug classifications

Carbonic anhydrase inhibitors: increased kidney stone formation
CNS depressants: increased CNS depression
hormonal contraceptives: decreased level of oral contraceptives

## NURSING CONSIDERATIONS

### Assessment

- **Bipolar disorder:** assess mood, behavior
- **Assess mental status:** mood, sensorium, affect, memory (long, short), especially in geriatric; suicidal thoughts/behavior
- Assess for blood dyscrasias: fever, sore throat, bruising, rash, jaundice, epistaxis (long-term treatment only)
- **Assess seizure activity** including type, location, duration, and character; provide seizure precaution
- Monitor CBC during long-term therapy; serum bicarbonate

• Assess body weight, perception of body image, eating disorders may occur or be exacerbated especially in adolescents; and evidence of cognitive disorder
• **Beers:** Avoid in older adults unless safer alternative is not available, may cause ataxia, impaired psychomotor function
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, birth defects have occurred, pregnant patients should register with the Antiepileptic Drug Pregnancy Registry 888-233-2334, may decrease hormonal contraceptives, caution use in breastfeeding, excretion unknown

### Patient/family education

• Teach patient to carry/wear emergency ID stating name, products taken, condition, prescriber's name and phone number
• Advise patient to avoid driving, other activities that require alertness, until response is known
• Teach patient not to discontinue medication abruptly after long-term use, do not restart if several doses are missed without close supervision, to follow prescriber's directions closely
• Advise patient to use nonhormonal contraceptive; effect of oral contraceptives is decreased, pregnancy
• Teach patient to drink plenty of fluids to prevent kidney stones, vision loss may occur
• Teach patient that increased dietary intake might be necessary, weight loss may occur
• Teach patient to swallow extended-release product whole
• Teach patient minor hair loss may occur, report to provider if severe

### Evaluation

**Positive therapeutic outcome**
• Decreased seizure activity

## TREATMENT OF OVERDOSE:

Lavage, VS

**⚠ HIGH ALERT**

## topotecan (Rx)

(to-poe'ti-kan)
**Hycamtin**
*Func. class:* Antineoplastic natural; topoisomerase inhibitor
*Chem. class.:* Camptothecin analog

## ACTION:

Antitumor product with topoisomerase I–inhibitory activity; topoisomerase I relieves torsional strain in DNA by causing single-strand breaks; causes double-strand DNA damage

**Therapeutic outcome:** Decreased tumor size

## USES:

Metastatic ovarian cancer after failure of traditional chemotherapy, relapsed small cell lung cancer, cervical cancer

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity, severe bone marrow depression

**BLACK BOX WARNING:** Neutropenia, bone marrow supression

**Precautions:** Children, renal disease, gelatin hypersensitivity, anemia, contraceptive requirements, dehydration, diarrhea, extravasation, herpes, infertility, neutropenia, pulmonary fibrosis, varicella

## DOSAGE AND ROUTES

### Metastatic carcinoma of the ovary after failure of first or subsequent chemotherapy; SCLC-sensitive disease after failure of first-line therapy

**Adult: IV** INF 1.5 mg/m$^2$ over 30 min/day × 5 days starting on day 1 of a 21-day course × 4 courses; may be reduced to 0.25 mg/m$^2$ for subsequent courses if severe neutropenia occurs

### With CISplatin stage IVB recurrent or persistent cervical cancer unresponsive to surgery or radiation

**Adult:** IV infusion 0.75 mg/m$^2$ on days 1, 2, 3 then 50 mg/m$^2$ CISplatin IV on day 1 then repeat q21day, adjust for toxicity

### Relapsed small-cell lung cancer (SCLC) in those with a prior complete or partial response, 45 days from end of first-line treatment

**Adult:** PO 2.3 mg/m$^2$/day on days 1-5 of a 21-day course

### Therapeutic drug monitoring

**Dosage adjustments for treatment-related toxicities:**
***Hematologic toxicity:*** Do not administer subsequent courses until neutrophils recover to >1000 cells/mm$^3$, platelets to > 100,000 cells/mm$^3$, and hemoglobin to > 9 g/dl
**Neutropenia:**
• ***Single agent (IV) (ANC <500 cells/mm$^3$):*** Reduce the dose of topotecan to 1.25 mg/m$^2$. Alternatively, granulocyte-colony stimulating factor (G-CSF) may be administered, starting at least 24 hr after the last dose of topotecan

• ***Single agent (oral) (ANC <500 cells/mm³ for ≥ 7 days, or ANC 500-1000 cells/mm³ lasting beyond day 21):*** Reduce the dose of topotecan to 1.9 mg/m²/day, with subsequent dose reductions by 0.4 mg/m2/day if necessary

**Thrombocytopenia:**

• ***Single agent (IV) (platelets <25,000 cells/mm³ in the previous cycle):*** Reduce dose to 1.25 mg/m²

• ***Single agent (oral) (platelets <25,000 cells/mm³):*** Reduce dose to 1.9 mg/m²/day, with subsequent dose reductions by 0.4 mg/m²/day if necessary

• ***In combination with cisplatin (IV) (platelets <25,000 cells/mm³ in the previous cycle):*** Reduce dose to 0.6 mg/m² and further to 0.45 mg/m² if necessary

**Neutropenic fever:**

• ***Single agent (oral) (ANC <500 cells/mm³ associated with fever or infection):*** Reduce to 1.9 mg/m²/day, with subsequent dose reductions by 0.4 mg/m²/day if necessary

• ***In combination with cisplatin (IV) (ANC <1000 cells/mm³ with temperature ≥ 38° C or 100.4° F):*** Reduce dose to 0.6 mg/m² and further to 0.45 mg/m² if necessary. Alternatively, G-CSF may be given, starting at least 24 hr after the last dose

**Diarrhea (grade 3 or 4):**

• ***Single agent (oral):*** Hold, when diarrhea resolves to grade ≤1, resume at 1.9 mg/m²/day, with subsequent dose reductions by 0.4 mg/m²/day if necessary

### Renal dose

**Adult: PO: CCr:** 50-80ml/min No change; **CCr 30-49 ml/min:** Reduce dose to 1.5 mg/m²/day; dose may be increased by 0.4 mg/m²/day after the first course if no severe hematologic or gastrointestinal toxicities occur; **CCr <30 ml/min:** Reduce dose to 0.6 mg/m²/day; dose may be increased by 0.4 mg/m²/day after the first course if no severe hematologic or gastrointestinal toxicities occur

**Adult: IV: CCr 40-60 ml/min:** No change; **CCr 20-39 ml/ min:** Reduce dose to 0.75 mg/m²; **CCr <20 ml/min:** unknown

**Available forms:** Lyophilized powder for inj 4 mg; cap 0.25, 1 mg

### Implementation

• Provide increased fluid intake to 2-3 L/day to prevent dehydration, unless contraindicated

• Change **IV** site q48hr

• Store caps in refrigerator; IV INF unopened at room temperature; protect both from light

**Intermittent IV infusion route**

• Visually inspect for particulate matter and discoloration prior to use

• Reconstitute each 4-mg vial with 4 ml sterile water for injection; use immediately, no preservative

• Withdraw the appropriate volume of the reconstituted solution; dilute further in 0.9% NaCl or $D_5W$ prior to administration

• The reconstituted solution is yellow or yellow-green

• Topotecan injection diluted for infusion is stable at room temperature with normal light for 24 hr

• Infuse over 30 min

## ADVERSE EFFECTS

**CNS:** Arthralgia, *asthenia, headache,* myalgia, *pain,* weakness

**GI:** *Abdominal pain, constipation,* diarrhea, obstruction, *nausea,* stomatitis, *vomiting,* increased ALT, AST, anorexia

**HEMA:** Neutropenia, leukopenia, thrombocytopenia, anemia, sepsis

**INTEG:** *Total alopecia*

**RESP:** Dyspnea, cough, interstitial lung disease

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly, completely absorbed |
| **Distribution** | 7%-35% protein binding |
| **Metabolism** | Liver |
| **Excretion** | Urine, feces to metabolites |
| **Half-life** | 2.8 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

CISplatin: increased myelosuppression

Itraconazole, mefloquine, niCARdipine, quiNIDine, RU-486, tamoxifen, testosterone, verapamil: avoid giving together

### Drug classifications

Anticoagulants, NSAIDs, platelet inhibitors, thrombolytics: increased bleeding risk

P-glycoprotein, breast cancer resistance protein inhibitors (amiodarone, clarithromycin, diltiazem, erythromycin, indinavir vaccines, toxoids: avoid using together

### Drug/food

Grapefruit juice: avoid use

## NURSING CONSIDERATIONS

### Assessment

• Monitor liver function tests: AST, ALT, alkaline phosphatase, which may be elevated; creatinine, BUN

**BLACK BOX WARNING: Bone marrow suppression:** Monitor CBC, differential, platelet count weekly; withhold product if WBC is <3500/mm$^3$ or platelet count is <100,000/mm$^3$; notify prescriber of these results; product should be discontinued

- Assess buccal cavity for dryness, sores or ulceration, white patches, oral pain, bleeding, dysphagia
- **Interstitial lung disease (ILD):** assess for fever, cough, dyspnea, hypoxia, may be fatal
- **Pregnancy/breastfeeding:** Do not use in pregnancy or breastfeeding, can cause fetal harm, use contraception during and for ≥ 1 mo after final dose (female), during and for 3 mo after final dose (males), may cause infertility in both males/females

### Patient/family education

- Advise patient to avoid foods with citric acid or hot flavor or rough texture if stomatitis is present; to drink adequate fluids
- Advise patient that total alopecia may occur; hair grows back but may be different in color and texture
- Advise patient to report stomatitis; any bleeding, white spots, ulcerations in mouth; tell patient to examine mouth daily; report symptoms

**BLACK BOX WARNING:** Teach patient to report signs of anemia; fatigue, headache, faintness, shortness of breath, irritability

- Teach patient to rinse mouth tid-qid with water, club soda; brush teeth bid-tid with soft brush or cotton-tipped applicator for stomatitis; use unwaxed dental floss
- Teach patient to use effective contraception during treatment and at least 1 mo after, males should use contraception during and for 3 mo after final dose, not to breastfeeding
- Advise patient to avoid OTC products without approval of prescriber
- Advise to avoid driving or other activities requiring alertness
- Advise to avoid vaccines, toxoids
- Teach patient not to crush or chew capsules
- Advise patient not to retake dose if vomiting occurs, notify provider

### Evaluation

**Positive therapeutic outcome**

- Decreased tumor size, spread of malignancy

**RARELY USED**

## toremifene (Rx)

(tor-em'ih-feen)

**Fareston**

*Func. class.:* Antineoplastic

*Chem. class.:* Antiestrogen hormone

**Therapeutic outcome:** Prevention of rapidly growing malignant cells

**USES:** Advanced breast carcinoma that has not responded to other therapy in estrogen-receptor-positive patients (usually postmenopausal)

### CONTRAINDICATIONS

Pregnancy, hypersensitivity, history of thromboembolism

**BLACK BOX WARNING:** QT prolongation

### DOSAGE AND ROUTES

**Adult:** PO 60 mg/day

**Available forms:** Tabs 60 mg

**⚠ HIGH ALERT**

## traMADol (Rx)

(trah'mah-dol)

**ConZip, Ultram, Ultram ER, Zytram** 🍁

*Func. class.:* Analgesic, miscellaneous

**Controlled Substance IV**

**Do not confuse:** traMADol/traZODone Ultram/lithium

**ACTION:** Binds to μ-opioid receptors and inhibits reuptake of norepinephrine, serotonin

**Therapeutic outcome:** Relief of pain

**USES:** Management of moderate to severe pain, chronic pain, headache, osteoarthritis

### CONTRAINDICATIONS

Hypersensitivity, acute intoxication with any CNS depressant, alcohol, asthma, children, adenoidectomy, GI obstruction, ileus, MAOIs

**BLACK BOX WARNING:** Respiratory depression

**Precautions:** Pregnancy, breastfeeding, children, geriatric, seizure disorder, renal/hepatic disease, head trauma, increased ICP, acute abdominal condition, product abuse, depression, suicidal ideation, abrupt discontinuation, constipation

**BLACK BOX WARNING:** Coadministration with other CNS depressants, neonatal opioid withdrawal syndrome

T

## DOSAGE AND ROUTES

### Mild to moderate pain

**Adult:** PO 25 mg qd, titrate by 25 mg ≥3 days to 100 mg/day (25 mg qid), then may increase by 50 mg ≥3 days to 200 mg (50 mg qid), then 50-100 mg q4-6hr, max 400 mg/day; use caution in elderly
**Geriatric >75 yr:** PO <300 mg/day in divided dose

### Hepatic dose

**Adult:** PO 50 mg q12hr

### Renal dose

**Adult (Child-Pugh C):** PO CCr <30 ml/min q12hr, max 200 mg/day; do not use ext rel tabs

### Moderate to severe chronic pain

**Adult:** PO-ER (Ultram ER) 100 mg daily, titrate upward q5day by 100 mg, max 300 mg/day; (Ryzolt) 100 mg, titrate upward q2-3day in 100-mg increments; max 300 mg/day; products are not interchangeable

**Available forms:** Tabs 50 mg; ext rel tab 100, 200, 300 mg; orally disintegrating tab 50 mg

### Implementation

- Do not break, crush, or chew ext rel product
- Give with antiemetic for nausea, vomiting
- Administer when pain is beginning to return; determine dosage interval by patient response
- Store in cool environment, protect from sunlight
- Give with or without food; ext rel: always give with food, or always give on empty stomach

## ADVERSE EFFECTS

**CNS:** Dizziness, CNS stimulation, somnolence, headache, anxiety, confusion, euphoria, seizures, hallucinations, sedation, neuroleptic malignant syndrome–like reactions
**CV:** Vasodilatation, orthostatic hypotension, tachycardia, hypertension, abnormal ECG
**EENT:** Visual disturbances
**GI:** Nausea, constipation, vomiting, dry mouth, diarrhea, abdominal pain, anorexia, flatulence, GI bleeding
**GU:** Urinary retention/frequency, menopausal symptoms, dysuria, menstrual disorder
**INTEG:** Pruritus, rash, urticaria, vesicles, flushing
**SYST:** Anaphylaxis, Stevens-Johnson syndrome, toxic epidermal necrolysis, serotonin syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly, almost completely absorbed |
| **Distribution** | Steady state 2 days |
| **Metabolism** | Extensively in liver, may cross blood-brain barrier |
| **Excretion** | Unchanged product 30% in urine, protein binding 20% |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

**BLACK BOX WARNING:** Alcohol: increased CNS depression

CarBAMazepine: decreased tramadol level

### Drug classifications

CYP3A4 inducers (barbiturates, bosentan, carBAMazepine, efavirenz, nevirapine, phenytoin, rifabutin, rifampin): decreased tramadol effect
CYP3A4 inhibitors (aprepitant, antiretroviral protease inhibitors, clarithromycin, danazol, delavirdine, diltiazem, erythromycin, fluconazole, FLUoxetine, fluvoxaMINE, imatinib, ketoconazole, mibefradil, nefazodone, telithromycin, voriconazole): increased traMADol levels
MAOIs: inhibition of norepinephrine and serotonin reuptake; use together with caution
Opiates, sedative/hypnotics: increased CNS depression
SSRIs, SNRIs, serotonin-receptor agonists: increased serotonin syndrome

### Drug/herb

Chamomile, hops, kava, skullcap, valerian: increased CNS depression
St. John's wort: avoid use

### Drug/lab test

Increased: creatinine, liver enzymes
Decreased: Hgb

## NURSING CONSIDERATIONS

### Assessment

- **Pain:** assess location, type, character; give before pain becomes extreme
- Assess for increased side effects in renal/hepatic disease

**BLACK BOX WARNING: Respiratory depression:** withhold if respirations ,12/min, may be compounded with use of other CNS depressants

• Monitor I&O ratio: check for decreasing output; may indicate urinary retention
• Assess need for product
• Assess for constipation and bowel pattern; increase fluids, bulk in diet
• **Hypersensitivity:** usually after beginning treatment
• **Beers:** Avoid in older adults, lowers seizure threshold, monitor for seizures frequently in those with a seizure disorder

**BLACK BOX WARNING:** Monitor CNS changes: dizziness, drowsiness, hallucinations, euphoria, LOC, pupil reaction

• Determine allergic reactions: rash, urticaria
• **Serotonin syndrome, neuroleptic malignant syndrome:** assess for increased heart rate, shivering, sweating, dilated pupils, tremors, high B/P, hyperthermia, headache, confusion; if these occur, stop product, administer a serotonin antagonist if needed

**BLACK BOX WARNING:** Neonatal opioid withdrawal syndrome: Prolonged use of opioids in the mother may result in withdrawal effects in the neonate, can be fatal, assess for irritability, hyperactivity, abnormal sleep pattern, high-pitched cry, tremor, vomiting, diarrhea, failure to gain weight in the neonate

• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, no well-controlled studies, do not use in labor/delivery, do not breastfeed

### Patient/family education

• Before taking, to tell health care provider if history of head injury, seizures, liver, kidney, thyroid problems, problems urinating, pancreas or gallbladder problems, abuse of street or prescription drugs, alcohol addiction, or mental health problems
• To tell health care provider if pregnant or planning to become pregnant. Prolonged use during pregnancy can cause withdrawal symptoms in the newborn baby that could be life-threatening if not recognized and treated. Do not breastfeed
• Not to take prescription, OTC products, vitamins, or herbal supplements without health care provider's approval
• Do not change dose, take exactly as prescribed by health care provider. Do not take more than prescribed dose and do not take more than 8 tablets per day. If a dose is missed, take next dose at usual time
• Notify health care provider if the dose does not control pain
• Do not stop taking product abruptly if taking regularly without talking to health care provider
• Do not drive or operate heavy machinery until affect is known, product may cause dizziness or lightheadedness
• Do not drink alcohol or use prescription or OTC products that contain alcohol
• Notify health care provider of severe constipation, nausea, sleepiness, vomiting, tiredness, headache, dizziness, abdominal pain
• Get emergency medical help if there is trouble breathing, shortness of breath, fast heartbeat, chest pain, swelling of face, tongue, or throat, extreme drowsiness, lightheadedness when changing positions, feeling faint, agitation, high body temperature, trouble walking, stiff muscles, or mental changes such as confusion

### Evaluation

**Positive therapeutic outcome**
• Decreased pain

**⚠ HIGH ALERT**
**RARELY USED**

## trametinib

(tra-me'ti-nib)
**MeKinist**
*Func. class.:* Antineoplastic biologic response modifier
*Chem. class.:* Signal transduction inhibitor (STI), tyrosine kinase inhibitor

**ACTION:** Inhibits MEK-1, MEK-2 tyrosine kinase created in patients with malignant melanoma

**Therapeutic outcome:** Decrease in progression of disease

**USES:** Unresectable or metastatic BRAD V600E or BRAF V600K mutated malignant melanoma

### CONTRAINDICATIONS

Pregnancy, hypersensitivity

**Precautions:** Breastfeeding, children, diarrhea, geriatric patients, hepatic disease, bone marrow suppression, infection, thrombocytopenia, neutropenia, immunosuppression

### DOSAGE AND ROUTES

**Adult: PO** 2 mg/day, may be used in combination with dacarbazine or PACLitaxel in those with BRAF V600E

#### Management of treatment-related toxicity

**Cutaneous toxicity**
• **Grade 2 rash:** reduce dose by 0.5 mg (e.g., 2 mg/day to 1.5 mg/day) or discontinue in patients who are receiving trametinib 1 mg/day.

In patients with an intolerable grade 2 rash that does not improve within 3 wk of a dosage reduction, withhold trametinib for up to 3 wk. If the rash is improved within 3 wk, resume therapy at a lower dose (reduce the previous dose by 0.5 mg). If the rash does not improve within 3 wk, permanently discontinue.

- **Grade 3 or 4 rash:** withhold for up to 3 wk. If the rash is improved within 3 wk, resume at a lower dose (reduce the previous dose by 0.5 mg); discontinue in patients who are receiving trametinib 1 mg/day. If the rash does not improve within 3 wk, permanently discontinue.

**Cardiac toxicity**

- **Asymptomatic cardiac toxicity and an absolute decrease in LVEF of ≥10% from baseline and below institutional lower limits of normal (LLN) from pretreatment value:** withhold for up to 4 wk. If the LVEF is improved within 4 wk, resume at a lower dose (reduce the previous dose by 0.5 mg); discontinue in patients who are receiving 1 mg/day. If the LVEF does not improve to normal within 4 wk, permanently discontinue.
- Symptomatic HF or an absolute decrease in LVEF of >20% from baseline and below institutional LLN: permanently discontinue

**Ocular toxicity**

- **Grade 2 or 3 retinal pigment epithelial detachment (RPED):** withhold for up to 3 wk. If the RPED improves to grade 1 or less within 3 wk, resume at a lower dose (reduce the previous dose by 0.5 mg); discontinue therapy in patients who are receiving 1 mg/day. If the RPED does not improve to at least grade 1 within 3 wk, permanently discontinue.
- **Retinal vein occlusion:** permanently discontinue therapy

**Pulmonary toxicity**

- **Interstitial lung disease/pneumonitis:** permanently discontinue

**Other toxicity**

- **Grade 3 toxicity:** withhold for up to 3 wk. If the toxicity improves to grade 1 or less within 3 wk, resume at a lower dose (reduce the previous dose by 0.5 mg); discontinue in patients who are receiving 1 mg/day. If the toxicity does not improve to at least grade 1 within 3 wk, permanently discontinue.
- **Grade 4 toxicity:** permanently discontinue

**Available forms:** Tabs 0.5, 2 mg

### Implementation

- Give 1 hr before or 2 hr after a meal
- If dose is missed, take within 12 hr of missed dose; if >12 hr have passed, skip dose
- Follow cytotoxic handling procedures

## ADVERSE EFFECTS

**CNS:** Dizziness
**CV:** Heart failure, hypertension, cardiomyopathy
**EENT:** Ocular hemorrhage, retinal detachment, blurred vision
**GI:** Diarrhea, nausea, vomiting, abdominal pain, stomatitis
**GU:** Hematuria
**INTEG:** Rash, pruritus, acne, folliculitis, erythema
**MISC:** Elevated LFTs, hand-foot syndrome
**MS:** Rhabdomyolysis
**RESP:** Cough, dyspnea, pleural effusion, pneumonitis, edema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 97.4% |
| **Metabolism** | Unknown |
| **Excretion** | In feces |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1.5 hr |
| **Duration** | Unknown |

## INTERACTIONS

None known

## NURSING CONSIDERATIONS

### Assessment

- Monitor LFTs every mo × 3 mo, then as clinically indicated

### Patient/family education

- Teach patient to report adverse reactions immediately, bleeding
- Teach patient about reason for treatment, expected results
- Teach patient to use effective contraception during treatment and up to 30 days after discontinuing treatment

### Evaluation

**Positive therapeutic outcome**

- Decrease in progression of disease

**RARELY USED**

## trandolapril (Rx)

(tran-doe'la-prill)
**Mavik**
*Func. class.:* Antihypertensive
*Chem. class.:* Angiotensin-converting enzyme (ACE) inhibitor

**ACTION:** Selectively suppresses renin-angiotensin-aldosterone system; inhibits ACE;

prevents conversion of angiotensin I to angiotensin II, resulting in dilatation of arterial and venous vessels and lowered B/P

**Therapeutic outcome:** Decreased B/P in hypertension

## USES:
Hypertension alone or in combination, heart failure, after MI, LV dysfunction after MI

## CONTRAINDICATIONS
Breastfeeding, hypersensitivity, history of angioedema

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Geriatric, hyperkalemia, hepatic disease, bilateral renal stenosis, after kidney transplant, aortal/mitral valve stenosis, cirrhosis, severe renal disease, untreated HF, autoimmune diseases, cough

## DOSAGE AND ROUTES
### Hypertension
**Adult:** PO 1 mg/day, 2 mg/day in African Americans, make dosage adjustment ≥1 wk; up to 8 mg/day

### Heart failure (after MI/left ventricular dysfunction)
**Adult:** PO 1 mg/day, titrate upward to 4 mg/day if tolerated, for 2-4 yr

### Renal dose/hepatic dose
**Adult:** PO CCr <30 ml/min or hepatic disease 0.5 mg/day

**Available forms:** Tabs 1, 2, 4 mg

### Implementation
- Store in airtight container at ≤77° F (≤25° C) or less
- Give without regard to food
- Space antacids by 2 hr after dose

## ADVERSE EFFECTS
**CNS:** *Dizziness,* paresthesias, headache, *syncope,* fatigue, drowsiness, depression, sleep disturbances, anxiety, syncope
**CV:** *Hypotension,* MI, palpitations, angina, TIAs, stroke, bradycardia, dysrhythmias
**GI:** Nausea, vomiting, cramps, diarrhea, constipation, pancreatitis, *dyspepsia*
**GU:** Proteinuria, renal failure
**HEMA:** Agranulocytosis, neutropenia, leukopenia, anemia
**INTEG:** Rash, purpura, pruritus, angioedema
**MISC:** Hyperkalemia, hyponatremia, impotence, *myalgia,* angioedema, muscle cramps, asthenia, hypocalcemia, gout
**RESP:** Dyspnea, cough

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 40%-60% |
| **Distribution** | Unknown |
| **Metabolism** | Liver |
| **Excretion** | Kidneys (33%), feces (66%) |
| **Half-life** | 0.6-1.1 hr, 16-24 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | ½ hr |
| **Peak** | 4-10 hr |
| **Duration** | >8 days |

## INTERACTIONS
### Individual drugs
Levodopa, lithium, reserpine: increased effect of each specific product

### Drug classifications
Antacids, NSAIDs, salicylates: decreased effect of trandolapril
Antihypertensives, diuretics: increased severe hypotension
Barbiturates, ergots, hypoglycemics, neuromuscular blocking agents: increased effects of each specific product
Diuretics (potassium-sparing): increased potassium levels
Phenothiazines: increased antihypertensive effects
Potassium supplements: increased potassium levels
Salt substitutes: increased potassium levels

### Drug/lab test
Increased: potassium, LFTs, BUN, creatinine
Decreased: sodium, WBC

## NURSING CONSIDERATIONS
### Assessment
- Monitor blood tests: neutrophils, decreased platelets
- Monitor B/P, orthostatic hypotension, syncope; if changes occur dosage change may be required
- Monitor renal studies: protein, BUN, creatinine; increased levels may indicate nephrotic syndrome and renal failure
- Monitor renal symptoms: polyuria, oliguria, frequency, dysuria
- Establish baselines in renal, liver function tests before therapy begins
- Check potassium levels throughout treatment, although hyperkalemia rarely occurs
- Check for edema in feet, legs daily
- Assess for allergic reactions: rash, fever, pruritus, urticaria; product should be discontinued if antihistamines fail to help

T

**BLACK BOX WARNING:** Pregnancy: Identify if pregnancy is planned or suspected; pregnancy

- **Hepatotoxicity (rare):** assess for increased LFTs, jaundice, fulminating hepatic necrosis; if jaundice occurs, discontinue product
- **Angioedema:** of the face, edema of the extremities, mucus membranes, may need to discontinue
- **Hyperkalemia:** monitor electrolytes, check potassium

### Patient/family education

- Advise patient not to discontinue product abruptly; advise patient to tell all persons associated with health care
- Teach patient not to use OTC products (cough, cold, allergy) unless directed by physician; serious side effects can occur; xanthines, such as coffee, tea, chocolate, cola, can prevent action of product
- Instruct patient on the importance of complying with dosage schedule, even if feeling better; to continue with medical regimen to decrease B/P: exercise, cessation of smoking, decreasing stress, diet modifications
- Emphasize the need to rise slowly to sitting or standing position to minimize orthostatic hypotension; not to exercise in hot weather, which can cause increased hypotension
- Advise patient to notify prescriber of mouth sores, sore throat, fever, swelling of hands or feet, irregular heartbeat, chest pain, coughing, shortness of breath
- Caution patient to report excessive perspiration, dehydration, vomiting, diarrhea; may lead to fall in B/P
- Caution patient that product may cause dizziness, fainting, light-headedness; may occur during 1st few days of therapy; to avoid activities that may be hazardous
- Teach patient how to take B/P and normal readings for age group

**BLACK BOX WARNING:** Teach patient to notify prescriber if pregnancy is suspected or planned, pregnancy

### Evaluation

**Positive therapeutic outcome**

- Decreased B/P in hypertension

## TREATMENT OF OVERDOSE:

Lavage, **IV** atropine for bradycardia, **IV** theophylline for bronchospasm, digoxin, $O_2$, diuretic for cardiac failure, hemodialysis

**⚠ HIGH ALERT**

## trastuzumab (Rx)

(tras-tuz′uh-mab)

**Herceptin**

*Func. class.:* Antineoplastic—miscellaneous

*Chem. class.:* Humanized monoclonal antibody

**ACTION:** DNA-derived monoclonal antibody selectively binds to extracellular portion of human epidermal growth factor receptor 2 (HER2); it inhibits proliferation of cancer cells

**Therapeutic outcome:** Decreasing symptoms of breast cancer

**USES:** Metastatic breast cancer with overexpression of HER2, early breast cancer (adjuvant, neoadjuvant), gastric cancer; previously untreated HER2 overexpressing metastatic gastric or gastroesophageal junction adenocarcinoma with CISplatin, 5-fluorouracil or capecitabine

## CONTRAINDICATIONS

Hypersensitivity to this product, Chinese hamster ovary cell protein

**Precautions:** Breastfeeding, children, geriatric, pulmonary disease, anemia, leukopenia

**BLACK BOX WARNING:** Cardiac disease, respiratory distress syndrome, respiratory insufficiency, infusion-related reactions, cardiomyopathy, pregnancy, pulmonary toxicity, contraception requirement

## DOSAGE AND ROUTES

**For adjuvant treatment of HER2-positive, node-positive, or node-negative (ER/PR negative or with one high-risk feature) breast cancer in combination with PACLitaxel, after completion of DOXOrubicin and cyclophosphamide chemotherapy (AC-TH)**

**Adult:** IV 4 mg/kg over 90 min on day 1, then 2 mg/kg over 30 min qwk for a total of 12 wk, with PACLitaxel (either 80 mg/m$^2$ IV wk or 175 mg/m$^2$ q3wk) beginning on day 1 for a total of 4 cycles (12 wk). On week 13, begin trastuzumab 6 mg/kg over 30 to 90 min q3wk as monotherapy for a total of 52 wk of trastuzumab therapy; begin PACLitaxel plus trastuzumab after the completion of 4 cycles of AC chemotherapy (DOXOrubicin 60 mg/m$^2$ IV and cyclophosphamide 600 mg/m$^2$ IV q21days)

**For adjuvant treatment of HER2-positive, node-positive, or node-negative (ER/PR negative or with one high-risk feature) breast cancer in combination with docetaxel after completion of DOXOrubicin and cyclophosphamide chemotherapy (AC-TH)**

**Adult:** IV 4 mg/kg IV over 90 min on day 1, then 2 mg/kg over 30 min qwk (total of 12 wk), with docetaxel 100 mg/m$^2$ IV q21days beginning on day 1 for a total of 4 cycles (12 wk). On week 13, begin trastuzumab 6 mg/kg IV over 30 to 90 min q3wk as monotherapy for a total of 52 wk of trastuzumab therapy. Begin docetaxel plus trastuzumab after the completion of 4 cycles of AC chemotherapy (DOXOrubicin 60 mg/m$^2$ IV and cyclophosphamide 600 mg/m$^2$ IV q21days)

**For adjuvant treatment of HER2-positive, node-positive, or node negative (ER/PR negative or with one high-risk feature) breast cancer in combination with carboplatin and docetaxel (TCH)**

**Adult:** IV 4 mg/kg over 90 min on day 1, then 2 mg/kg over 30 min wk (total of 18 wk), with docetaxel 75 mg/m$^2$ IV followed by carboplatin AUC 6 IV over 30 to 60 min beginning on day 1, q3wk, for a total of 6 cycles (18 wk). On week 19, begin trastuzumab 6 mg/kg IV over 30 to 90 min q3wk as monotherapy (52 wk of trastuzumab)

**For adjuvant treatment of HER2-positive, node-positive, or node-negative (ER/PR negative or with one high-risk feature) breast cancer as monotherapy after multimodality anthracycline-based chemotherapy**

**Adult:** IV 8 mg/kg over 90 min on day 1, followed by 6 mg/kg IV over 30 to 90 min q21days (total of 52 wk)

**For the first-line treatment of HER2-positive metastatic breast cancer in combination with PACLitaxel**

**Adult:** IV 4 mg/kg over 90 min on day 1, then 2 mg/kg IV over 30 min qwk until disease progression in combination with PACLitaxel 175 mg/m$^2$ IV over 3 hr on day 1, q21days for ≥6 cycles. Continue PACLitaxel 175 mg/m2 IV over 3 hr q21days for ≥6 cycles

**For the treatment of HER2-positive metastatic breast cancer as a single agent in patients who have failed one or more chemotherapy regimens for metastatic disease**

**Adult:** IV 4 mg/kg over 90 min on day 1, followed by 2 mg/kg IV over 30 min wk until disease progression

## Therapeutic drug monitoring

**Dosage adjustments for cardiotoxicity**

- ***First, second, or third occurrence, ≥16% absolute decrease in left ventricular ejection fraction (LVEF) from baseline, or LVEF below institutional limit of normal with ≥10% absolute decrease in LVEF from baseline:*** Hold for 4 to 8 wk and monitor ejection fraction with a MUGA scan or echocardiogram q4wk. If LVEF returns to normal limits with an absolute decrease from baseline of ≤15% within 4-8 weeks, resume, if decrease in LVEF persists >8 wk, permanently discontinue
- ***Fourth occurrence, ≥16% absolute decrease in left ventricular ejection fraction (LVEF) from baseline, or LVEF below institutional limit of normal with ≥10% absolute decrease in LVEF from baseline:*** Permanently discontinue

**Available forms:** Lyophilized powder 150, 440 mg

### Implementation

- Give acetaminophen as ordered to alleviate fever and headache
- Increase fluid intake to 2-3 L/day

**Intermittent IV infusion route**

- Use cytotoxic handling procedures, avoid treatment over 1 yr
- Administer after reconstituting vial with 20 ml of bacteriostatic water for inj, 1.1% benzyl alcohol preserved (supplied) to yield 21 mg/ml, mark date on vial 28 days from reconstitution date; if patient is allergic to benzyl alcohol, reconstitute with sterile water for inj; use immediately; inf over 90 min; q3wk give 8 mg/kg loading dose over 90 min; subsequent doses 6 mg/kg may be given over 30-60 min
- Do not mix or dilute with other products or dextrose sol

## ADVERSE EFFECTS

**CNS:** *Dizziness, numbness, paresthesias,* depression, *insomnia,* neuropathy, peripheral neuritis
**CV:** Tachycardia, HF
**GI:** Nausea, vomiting, *anorexia, diarrhea,* abdominal pain, hepatotoxicity, dysgeusia
**HEMA:** *Anemia,* leukopenia
**INTEG:** *Rash,* acne, herpes simplex
**META:** Edema, peripheral edema
**MISC:** *Flulike symptoms; fever, headache, chills*
**MS:** Arthralgia, *bone pain*

T

**RESP:** *Cough, dyspnea, pharyngitis, rhinitis,* sinusitis, pneumonia, pulmonary edema/fibrosis, acute respiratory distress syndrome (ARDS)
**SYST:** Anaphylaxis, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 1-32 days, 97% of washout by 7 mo after end of treatment |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Cyclophosphamide: increased cardiomyopathy risk; avoid use
Warfarin: increased bleeding risk

### Drug classifications

Anthracyclines: increased cardiomyopathy risk
Vaccines/toxoids: decreased immune response

### Drug/lab

Decrease: WBC, RBC

## NURSING CONSIDERATIONS

### Assessment

- Monitor CBC, HER2 overexpression
- Assess for symptoms of infection; may be masked by product
- Assess CNS reaction: LOC, mental status, dizziness, confusion

**BLACK BOX WARNING: HF and other cardiac symptoms:** assess for dyspnea, coughing, gallop; obtain a full cardiac workup including before and q3mo during treatment and q6mo for ≥ 2 yr after adjuvant treatment (LVEF, MUGA, or ECHO, monitor for clinical deterioration in those with decreased LEVF)

- Hypersensitivity reactions, anaphylaxis

**BLACK BOX WARNING: Potentially fatal infusion reactions:** assess for fever, chills, nausea, vomiting, pain, headache, dizziness, hypotension; discontinue product

- **Pulmonary toxicity:** assess for dyspnea, interstitial pneumonitis, pulmonary hypertension, ARDS; can occur after infusion reaction, those with lung disease may have more severe toxicity
- **Benzyl alcohol hypersensitivity:** Reconstitute with sterile water for injection, USP. Discard any unused portion
- **Hamster protein hypersensitivity (Chinese hamster ovary cell hypersensitivity):** Assess for hypersensitivity due to increased risk of severe allergic reactions

**BLACK BOX WARNING: Pregnancy/breastfeeding:** Fetal harm may occur if given during pregnancy or within 7 mo of conception; monitoring for oligohydramnios is recommended. If oligohydramnios occurs, fetal testing should be done that is appropriate for gestational age. Encourage these women to enroll in the MotHER Pregnancy Registry by contacting 800-690-6720 or visiting http://www.motherpregnancyregistry.com. Counsel patients about the reproductive risk and contraception requirements during trastuzumab treatment. Trastuzumab can be teratogenic if taken by the mother during pregnancy or within 7 mo before conception. Effective contraception should be used during and for at least 7 mo after treatment Females of reproductive potential should undergo pregnancy testing before use. Women who become pregnant while receiving or within 7 mo of the last dose should be apprised of the potential hazard to the fetus. It is not known whether the product is excreted into human milk, advise women to discontinue breastfeeding during treatment and for 7 mo after the last dose

### Patient/family education

- Advise patient to take acetaminophen for fever
- Teach patient to avoid hazardous tasks, since confusion, dizziness may occur
- Teach patient to report signs of infection: sore throat, fever, diarrhea, vomiting
- Inform patient that emotional lability is common; instruct patient to notify prescriber if severe or incapacitating

**BLACK BOX WARNING:** Advise patient to use contraception while taking this product or within 7 mo of pregnancy; not to breastfeeding

**BLACK BOX WARNING:** Teach patient to report pain at infusion site, usually with first dose

**BLACK BOX WARNING:** Cardiomyopathy: Teach patient to report cough, swelling in extremities, shortness of breath, may occur during or after completion of treatment

### Evaluation

**Positive therapeutic outcome**
- Decrease in size of tumors

## travoprost ophthalmic

*See Appendix B*

## traZODone (Rx)

(tray′zoe-done)
**Oleptro**
*Func. class.:* Antidepressant—miscellaneous
*Chem. class.:* Triazolopyridine

**ACTION:** Selectively inhibits serotonin, norepinephrine uptake by brain, potentiates behavioral changes

**Therapeutic outcome:** Decreased symptoms of depression after 2-3 wk

**USES:** Depression

## CONTRAINDICATIONS

Hypersensitivity to tricyclics

**Precautions:** Pregnancy, suicidal patients, severe depression, increased intraocular pressure, closed-angle glaucoma, urinary retention, cardiac/hepatic disease, hyperthyroidism, electroshock therapy, elective surgery, bleeding, abrupt discontinuation, bipolar disorder, breastfeeding, dehydration, hyponatremia, hypovolemia, recovery phase of MI, seizure disorders, prostatic hypertrophy, family history of long QT

**BLACK BOX WARNING:** Suicidal ideation in children/adolescents

## DOSAGE AND ROUTES

### Depression

**Adult:** PO 150 mg/day in divided doses; may increase by 50 mg/day q3-4day, max 400 mg/day (outpatient), 600 mg/day (inpatient); EXT REL 150 mg/day in the evening, may increase gradually by 75 mg/day at 3 day intervals, max 375 mg/day
**Geriatric:** PO 25-50 at bedtime, increase by 25-50 mg q3-7day to desired dose, usual 75-150 mg/day
**Child 6-18 yr (unlabeled):** PO 1.5-2 mg/kg/day in divided doses, may increase q3-4day up to 6 mg/kg/day or 400 mg/day in divided doses, whichever is less

**Available forms:** Tabs 50, 100, 150, 300 mg; ext rel tabs 150, 300 mg

### Implementation

- Give with food or milk for GI symptoms; crush if patient is unable to swallow medication whole
- Give dose at bedtime if oversedation occurs during day; may take entire dose at bedtime; geriatric may not tolerate once/day dosing
- Store in tight, light-resistant container at room temp; do not freeze

## ADVERSE EFFECTS

**CNS:** *Dizziness, drowsiness,* confusion, headache, anxiety, tremors, stimulation, weakness, insomnia, nightmares, EPS (geriatric), increase in psychiatric symptoms, suicide in children/adolescents
**CV:** *Orthostatic hypotension, ECG changes, tachycardia,* hypertension, palpitations
**EENT:** *Blurred vision,* tinnitus, mydriasis
**GI:** *Diarrhea, dry mouth,* nausea, vomiting, paralytic ileus, increased appetite, cramps, epigastric distress, jaundice, hepatitis, stomatitis, constipation
**GU:** *Retention,* acute renal failure, priapism
**HEMA:** Agranulocytosis, thrombocytopenia, eosinophilia, leukopenia
**INTEG:** Rash, urticaria, sweating, pruritus, photosensitivity

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys, minimally unchanged |
| **Half-life** | 4½-7½ hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1 hr without food, 2 hr with food |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol, carBAMazepine, digoxin, phenytoin: increased effect of each product
FLUoxetine, nefazodone: increased levels, increased toxicity, serotonin syndrome
Guanethidine, cloNIDine: decreased effects of each product
Warfarin: increased or decreased effects of warfarin

### Drug classifications

Barbiturates, benzodiazepines, CNS depressants: increased effects
CYP3A4, 2D6 inhibitors (phenothiazines, protease inhibitors, azole antifungals): increased effects of trazodone

T

MAOIs: increased hyperpyretic crisis, seizures, hypertensive episode, do not use within 14 days
SNRIs, SSRIs: increased toxicity, serotonin syndrome
Sympathomimetics (direct-acting): increased sympathomimetic effects
Sympathomimetics (indirect-acting): decreased effects

### Drug/herb

Hops, kava, lavender, valerian: increased CNS depression
SAM-e, St. John's wort: increased serotonin syndrome

### Drug/lab test

Increased: LFTs
Decreased: Hgb

## NURSING CONSIDERATIONS

### Assessment

- Monitor B/P (lying, standing), pulse q4hr; if systolic B/P drops 20 mm Hg hold product, notify prescriber; take vital signs q4hr in patients with CV disease
- Monitor blood tests: CBC, leukocytes, differential
- Monitor liver function tests: AST, ALT, bilirubin
- Check weight qwk; appetite may increase with product
- Assess ECG for flattening of T wave, bundle branch block, AV block, dysrhythmias in cardiac patients
- Assess for EPS primarily in geriatric: rigidity, dystonia, akathisia

**BLACK BOX WARNING:** Assess mental status: mood, sensorium, affect, suicidal tendencies in children/adolescents; increase in psychiatric symptoms: depression, panic, not approved for children, if worsening depression occurs, product may need to be tapered as rapidly as possible without abrupt discontinuation

- Monitor urinary retention, constipation; constipation is more likely to occur in children or geriatric
- **Withdrawal symptoms:** assess for headache, nausea, vomiting, muscle pain, weakness; do not usually occur unless product was discontinued abruptly
- Identify alcohol consumption; if alcohol is consumed, hold dose until AM
- **Serotonin syndrome, neuroleptic malignant syndrome:** assess for increased heart rate, shivering, sweating, dilated pupils, tremors, high B/P, hyperthermia, headache, confusion; if these occur, stop product, administer a serotonin antagonist if needed
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, no well-controlled studies, cautious use in breastfeeding, excreted in breast milk

### Patient/family education

- Teach patient that therapeutic effects may take 2-3 wk
- Teach patient to use caution in driving or other activities requiring alertness because of drowsiness, dizziness, blurred vision; to avoid rising quickly from sitting to standing, especially geriatric
- Teach patient not to crush, chew ext rel product
- Caution patient to avoid alcohol ingestion, other CNS depressants
- Teach patient not to discontinue medication quickly after long-term use: may cause nausea, headache, malaise
- Advise patient to wear sunscreen or large hat because photosensitivity occurs
- Teach patient to increase fluids, bulk in diet if constipation, urinary retention occur, especially geriatric
- Advise patient to take gum, hard sugarless candy, or frequent sips of water for dry mouth
- Advise patient to rise slowly to prevent dizziness

**BLACK BOX WARNING:** Teach family to watch for suicidal ideation or tendencies, usually in children/adolescents, to notify provider if there is an increase in depression, agitation

- Teach patient to notify prescriber if pregnancy is planned or suspected, pregnancy (C), avoid breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Decrease in depression
- Absence of suicidal thoughts

## TREATMENT OF OVERDOSE:

ECG monitoring, induce emesis, lavage, administer anticonvulsant

## treprostinil (Rx)

(treh-prah'stin-ill)
**Orenitram, Remodulin, Tyvaso**
*Func. class.:* Antihypertensive vasodilator
*Chem. class.:* Tricyclic benzidine prostacyclin analog

**ACTION:** Direct vasodilatation of pulmonary, systemic arterial vascular beds, inhibition of platelet aggregation

**Therapeutic outcome:** Decreased pulmonary arterial hypertension (PAH)

**USES:** PAH, NYHA class II through IV

## CONTRAINDICATIONS

Hypersensitivity to this product or other prostacyclin analogs

**Precautions:** Pregnancy, breastfeeding, children, geriatric, past hepatic disease, renal/thromboembolic disease, abrupt discontinuation, **IV** administration

## DOSAGE AND ROUTES

### For the treatment of pulmonary arterial hypertension (WHO Group 1) to diminish symptoms associated with exercise

**Adult: SUBCUT CONT INF /IV CONT INF** 1.25 ng/kg/min initially. If not tolerated, reduce to 0.625 ng/kg/min. Increase dose by increments ≤ 1.25 ng/kg/min per wk × first 4 wk, then no more than 2.5 ng/kg/min per wk for the remaining duration of infusion, depending on response; if tolerated, the dose may be adjusted more frequently; **ORAL INH:** Initially, 3 breaths (18 mcg) inhaled via the Tyvaso Inhalation System qid 4 hr apart during waking hours; the patient should take 3 breaths during each treatment session. If 3 breaths are not tolerated, reduce to 1 or 2 breaths and subsequently increase to 3 breaths, as tolerated. Increase dose by an additional 3 breaths at approximately 1 to 2 wk intervals, if tolerated, until the target dose of 9 breaths (54 mcg)/treatment session is reached. If target dose cannot be reached due to adverse effects, continue at the highest tolerated dose; **PO:** 0.25 mg q12hr or 0.125 mg q8hr, increase by 0.25 or 0.5 mg bid or 0.125 mg tid q3 to q4 days as tolerated

**Adults taking gemfibrozil (or other strong CYP2C8 inhibitors):** PO 0.125 mg q12hr, increase by 0.125 mg bid q3 to q4 days, as tolerated

### For patients transitioning from IV or SUBCUT to PO

**Adult:** PO For patients already receiving IV or SUBCUT, use the following equation to estimate a comparable total daily dose of POI: Total Daily PO Dose = 0.0072 × IV or SUBCUT Dose (ng/kg/minute) × Weight (kg). Reduce the dose of IV or SUBCUT by up to 30 ng/kg/min per day while simultaneously increasing the dose of PO up to 6 mg/day (2 mg PO tid), if tolerated

### For temporary SUBCUT/IV infusion in those unable to take PO due to a planned, short-term treatment interruption

**Adult: IV/SUBCUT CONT INF:** For those receiving PO product, use the following equation to calculate the parenteral dose: IV/SUBCUT (ng/kg/min) = 139 × Total Daily POI Dose (mg)/Weight (kg)

### For patients transitioning from epoprostenol to IV/SUBCUT

The transition from epoprostenol to treprostinil should take place in a hospital with continuous observation to response (walking distance and signs and symptoms of disease progression)

**Adult: IV/SUBCUT INF:** To transition from epoprostenol to treprostinil, initiate the infusion of treprostinil and increase it while reducing the dose of IV epoprostenol. In the following stepwise approach, the initial epoprostenol dose is defined as the dose the patient was receiving at the beginning of the conversion to treprostinil. **Step 1:** Initiate an infusion of treprostinil that is 10% of the current epoprostenol dose; continue with the same epoprostenol dose; **Step 2:** Increase the treprostinil dose to 30% of the initial epoprostenol dose; reduce the epoprostenol dose to 80% of the initial dose; **Step 3:** Increase the treprostinil dose to 50% of the initial epoprostenol dose; reduce the epoprostenol dose to 60% of the initial dose; **Step 4:** Increase the treprostinil dose to 70% of the initial epoprostenol dose; reduce the epoprostenol dose to 40% of the initial dose; **Step 5:** Increase the treprostinil dose to 90% of the initial epoprostenol dose; reduce the epoprostenol dose to 20% of the initial dose; **Step 6:** Increase the treprostinil dose to 110% of the initial epoprostenol dose; reduce the epoprostenol dose to 5% of the initial dose; **Step 7:** Increase the treprostinil dose by 5% to 10% increments as needed; discontinue epoprostenol. Individually titrate the dose of treprostinil in a manner that balances prostacyclin-limiting adverse events. During the transition, increases in PAH symptoms (e.g., fatigue, dyspnea, chest pain, and pallor) should first be managed by increasing the dose of treprostinil; symptoms associated with prostacyclin and prostacyclin analogs (e.g., facial flush, headache, jaw pain, abdominal cramping, diarrhea, and hypotension) should first be managed by decreasing the dose of epoprostenol

### Hepatic dose

**Adult:** SUBCUT INF 0.625 ng/kg ideal body weight/min and increase cautiously

**Available forms:** Inj 1, 2.5, 5, 10 mg/ml; neb sol 1.74 mg/2.9 ml; ER tabs 0.125, 0.25, 2.5 mg

### Implementation

#### PO route

- Give with food, swallow tablets whole, and use only intact tablets

**INJ route**
• Visually inspect for particulate matter and discoloration before use
• Administer the injection by continuous SUBCUT infusion as the preferred route. May be administered by continuous IV infusion in those who do not tolerate continuous SUBCUT (severe injection site pain or reaction)
• Have immediate access to a backup infusion pump and infusion sets. Avoid abrupt discontinuation of the infusion. If temporary cessation is necessary for less than a few hours, the infusion can be restarted at the previously used dose and rate; if the infusion is stopped for longer than a few hours, retitration may be necessary
• The infusion pump used should be small and lightweight; adjustable to approximately 0.002 ml/hr; have alarms for occlusion, end of infusion and low battery, programming error, and motor malfunctions; accurate to +/- 6% of the programmed rate; and positive-pressure driven. The reservoir should be made of polyvinyl chloride, polypropylene, or glass
• ***Opened vials:*** A single vial should be used ≤ 30 days after the initial entry into the vial

**CONT IV route**
• Give via a surgically placed central venous catheter via an ambulatory infusion pump. A peripheral IV cannula, placed into a large vein, may be used temporarily; use of a peripheral vein for more than a few hours may increase the risk of thrombophlebitis
• Infusion sets with an inline 0.22- or 0.2-micron pore size filter should be used

**IV infusion preparation:**
• May be diluted with Remodulin sterile diluent for injection or similar approved high-pH glycine diluents (sterile diluent for Flolan or sterile diluent for epoprostenol sodium), sterile water for injection, or 0.9% NaCl for injection
• The concentration of diluted treprostinil should be calculated using the following formula:

$$\text{diluted concentration} = \frac{[\text{dose (ng/kg/min)} \times \text{weight (kg)} \times 0.00006]}{\text{IV infusion rare (ml/hr)}}$$

• Typical ambulatory infusion pump reservoirs have volumes of 50 or 100 ml. The IV infusion rate is predetermined based on the volume of the reservoir, with a desired infusion length of 48 hr (i.e., for a 50-ml reservoir, the infusion rate would be 1 ml/hr; for a 100-ml reservoir, the infusion rate would be 2 ml/hr)
• The amount of treprostinil needed to make the required concentration for the given reservoir can be calculated using the following formula:

$$\text{ml of treprostinil injection} = \frac{[\text{diluted concentration (mg/ml)}}{\text{treprostinil vial strength (mg/ml)}]} \times \text{total volume of diluted treprostinil solution in reservoir (ml)}$$

• The reservoir should be filled with the calculated volume and a sufficient amount of diluent to achieve the total volume of the reservoir
• Once diluted with any diluent, may be given for 48 hr at 40° C
• ***Store:*** If diluted with sterile water for injection or 0.9% NaCl, store up to 4 hr at room temperature or 24 hr if refrigerated. If diluted with an approved high-pH glycine diluent (sterile diluent for Remodulin, Flolan, or epoprostenol sodium), it may be stored for 14 days at room temperature at concentrations as low as 0.004 mg/ml

**SUBCUT CONT INF route**
• Give via a self-inserted SUBCUT catheter using an ambulatory infusion pump designed for subcutaneous drug delivery

**SUBCUT infusion preparation:**
• Further dilution is NOT required before continuous SUBCUT use
• Do not mix or coinfuse with other medications
• The SUBCUT infusion rate can be calculated using the following formula:

$$\text{Subcutaneous infusion rate} = \frac{[\text{dose (ng/kg/min)} \times \text{weight (kg)} \times 0.00006]}{\text{treprostinil vial strength (mg/ml)}}$$

• During SUBCUT use, a single reservoir (syringe) of product can be given ≤ 72 h at a max temperature of 37° C (98.6° F)

**Oral inhalation administration**
• Must be used only with the Tyvaso Inhalation System
• Avoid skin or eye contact with solution. Do not take PO
• Have access to a backup Opti-Neb-ir device to avoid interruptions in therapy
• Do not mix with other medications in the Opti-Neb-ir device
• One ampule contains a volume for all four treatment sessions in a single day

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, syncope
**CV:** Vasodilatation, *hypotension, edema,* right ventricular heart failure

**GI:** Nausea, *diarrhea*
**INTEG:** *Rash,* pruritus
**OTHER:** Jaw pain, cough, throat irritation
**SYST:** Infusion site reactions, inf site pain, increased risk of infection

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver, 90% protein binding |
| **Excretion** | Urine, feces |
| **Half-life** | 2-4 hr, terminal |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drug

Aspirin: increased risk of bleeding

### Drug classifications

Anticoagulants, NSAIDs, SSRIs, thrombin inhibitors: increased risk of bleeding
Antihypertensives, β-blockers, calcium channel blockers, diuretics, MAOIs, vasodilators: increased hypotension

## NURSING CONSIDERATIONS

### Assessment

- **Hypertension:** monitor B/P baseline and periodically
- Monitor liver function tests: AST, ALT, bilirubin, creatinine (long-term therapy)
- **Monitor blood tests:** CBC; CBC q2wk × 3 mo, Hct, Hgb, pro-time (long-term therapy), ABGs
- Monitor bleed time baseline and throughout; levels may be 2-5 × normal limit
- **Pregnancy/breastfeeding:** Use only if clearly needed, no well-controlled studies, cautious use in breastfeeding, excretion unknown
- **Beers:** Use with caution in older adults may exacerbate episodes of syncope, monitor frequently

### Patient/family education

- Teach patient that blood work will be necessary during treatment
- Teach patient to report side effects such as diarrhea, skin rashes
- Teach patient that therapy will be needed for prolonged periods of time, sometimes years
- Advise patient that aseptic technique must be used in preparing and administering to prevent infection
- Teach that there are many drug and herb interactions
- Teach signs/symptoms of bleeding: blood in urine, stools
- Teach patient to avoid abrupt discontinuation
- Teach patient how to use inhaled solution and how to care for equipment

### Evaluation

**Positive therapeutic outcome**
- Decreased pulmonary arterial hypertension

## tretinoin (vitamin A acid, retinoic acid) (Rx)

(tret'i-noyn)
**Avita, Renova, Retin-A, Retin-A Micro, Stieva-A** 🍁
*Func. class.:* Vitamin A acid/acne product, antineoplastic—miscellaneous
*Chem. class.:* Tretinoin derivative

**ACTION:** (Topical) Decreases cohesiveness of follicular epithelium, decreases microcomedone formation; (PO) induces maturation of acute promyelocytic leukemia, exact action is unknown

**Therapeutic outcome:** Decreased signs/symptoms of leukemia

**USES:** (Topical) Acne vulgaris (grades 1-3); (PO) acute promyelocytic leukemia, facial wrinkles, photoaging

## CONTRAINDICATIONS

Hypersensitivity to retinoids or sensitivity to parabens

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Pregnancy (topical), breastfeeding, eczema, sunburn, sun exposure

**BLACK BOX WARNING:** Rapid-evolving leukocytosis, respiratory compromise, acute promyelocytic leukemia differentiation syndrome, requires a specialized care setting, experienced clinician

## DOSAGE AND ROUTES

**Adult and child:** TOP cleanse area, apply 0.025%-0.1% cream or 0.05% liquid at bedtime; cover lightly

### Promyelocytic leukemia

**Adult:** PO 45 mg/m$^2$/day given as 2 evenly divided doses until remission; discontinue treatment 30 days after remission or after 90 days of treatment, whichever is first

**Available forms:** Topical cream 0.01%, 0.02%, 0.025%, 0.05%, 0.1%; topical gel 0.025%, 0.04%, 0.05%, 0.1%; topical liquid 0.05%; caps 10 mg

### Implementation
**Topical route**
- Apply using gloves or cotton, once daily before bedtime; cover area lightly using gauze
- Store at room temperature
- Wash hands after application
- Apply only to affected areas

## ADVERSE EFFECTS
### PO route
**CNS:** Headache, fever, sweating, fatigue
**CV:** Cardiac dysrhythmias, pericardial effusion
**GI:** Nausea, vomiting, hemorrhage, abdominal pain, diarrhea, constipation, dyspepsia, distention, hepatitis
**META:** Hypercholesterolemia, hypertriglyceridemia
**RESP:** Pneumonia, upper respiratory tract disease

### Topical route
**INTEG:** Rash, stinging, warmth, redness, erythema, blistering, crusting, peeling, contact dermatitis, hypo/hyperpigmentation, dry skin, pruritus, scaly skin, retinoic acid syndrome (RAS)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Small amounts |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Kidneys |
| **Half-life** | Unknown |

### Pharmacodynamics
Unknown

## INTERACTIONS
### Individual drugs
Aminocaproic acid, aprotinin, tranexamic acid: increased thrombotic complications
Benzoyl peroxide, resorcinol, salicylic acid (topical), sulfur: increased peeling
Ketoconazole: increased plasma concentrations of tretinoin (oral)

### Drug classifications
Alcohol, astringents, cleansers with drying effect, medicated, abrasive soaps: use with caution (topical)
Diuretics (thiazide), phenothiazines, quinolones, retinoids, sulfonamides, sulfonylureas: increased photosensitivity
Tetracyclines: increased ICP, risk of pseudotumor cerebri; do not use together

### Drug/lab test
Increased: AST, ALT

## NURSING CONSIDERATIONS
### Assessment
**Topical route**
- Assess part of body involved, including time involved, what helps or aggravates condition, cysts, dryness, itching; lesions may become worse at beginning of treatment

**PO route**
- Monitor hepatic function, coagulation, hematologic parameters, also cholesterol, triglycerides
- **Pregnancy/breastfeeding:** Do not use in pregnancy/breastfeeding (PO)

### Patient/family education
**Topical route**
- Instruct patient to avoid application on normal skin, to avoid getting cream in eyes, nose, other mucous membranes
- Advise patient to avoid sunlight, sunlamps or to use protective clothing or sunscreen to prevent burns
- Advise patient that treatment may cause warmth, stinging; dryness, peeling will occur
- Inform patient that cosmetics may be used over product; not to use shaving lotions
- Inform patient that rash may occur during first 1-3 wk of therapy
- Caution patient that product does not cure condition, only relieves symptoms; that therapeutic results may be seen in 2-3 wk but may not be optimal until after 6 wk

**PO route**

**BLACK BOX WARNING:** Advise patient to report to prescriber if pregnancy is planned or suspected, pregnancy (PO)

### Evaluation
**Positive therapeutic outcome**
- Decrease in size and number of lesions

**tretinoin topical**
*See Appendix B*

## triamcinolone (Rx)
(trye-am-sin'oh-lone)
**Aristospan, Kenalog-10, Kenalog-40, Tac-3, Tac-40, Triesence**
*Func. class.:* Corticosteroid, synthetic; antiinflammatory
*Chem. class.:* Glucocorticoid, intermediate-acting

**ACTION:** Decreases inflammation by suppressing migration of polymorphonuclear

leukocytes, fibroblasts, reversal of increased capillary permeability and lysosomal stabilization

**Therapeutic outcome:** Decreased inflammation, normal immune response

## USES:

Severe inflammation, immunosuppression, neoplasms, asthma (steroid dependent), collagen, respiratory, dermatologic disorders, rheumatic disorders

## CONTRAINDICATIONS

Hypersensitivity, neonatal prematurity, epidural/intrathecal administration (triamcinolone acetonide injections [Kenalog]), systemic fungal infections

**Precautions:** Pregnancy, breastfeeding, diabetes mellitus, glaucoma, osteoporosis, seizure disorders, ulcerative colitis, HF, myasthenia gravis, renal disease, esophagitis, peptic ulcer, acne, cataracts, coagulopathy, head trauma, children <2 yr, psychosis, idiopathic thrombocytopenia, acute glomerulonephritis, amebiasis, fungal infections, nonasthmatic bronchial disease, AIDS, TB, adrenal insufficiency, acute bronchospasm, acne rosacea, Cushing's syndrome, acute MI, thromboembolism

## DOSAGE AND ROUTES

**Adult:** IM 40 mg qwk (acetonide), 5-48 mg into neoplasms (acetonide), 2-40 mg into joint or soft tissue (hexacetonide), 0.5 mg/sq in of affected intralesional skin (hexacetonide), 2-20 mg into joint or soft tissue (hexacetonide)

### Severe/incapacitating allergic conditions such as asthma

**Adult:** IM (Trivaris) 60 mg, titrate; usual range 40-80 mg

**Child:** IM (Trivaris) 0.11-1.6 mg/kg/day (3.2-48 mg/m$^2$/day) given in 3-4 divided doses

**Available forms:** Inj 3, 10, 40 mg/ml acetonide; inj 5, 20 mg/ml hexacetonide; inh 100 mcg/spray

### Implementation

**PO route**

- Give with food or milk to decrease GI symptoms; tablet may be crushed

**IM route**

- Give IM inj deeply in large muscle mass; rotate sites; avoid deltoid; use 21-G needle
- Avoid SUBCUT administration, may damage tissue

**Inhalation route**

- Use spacer device for geriatric
- Give inh with water to decrease possibility of fungal infections; titrated dose, use lowest effective dose
- Give after cleaning aerosol top daily with warm water, dry thoroughly
- Store in cool environment; do not puncture or incinerate container

**Topical route**

- Apply only to affected areas; do not get in eyes
- Apply medication, then cover with occlusive dressing (only if prescribed), seal to normal skin, change q12hr; systemic absorption may occur
- Apply only to dermatoses; do not use on weeping, denuded, or infected areas
- Cleanse skin before applying product
- Continue treatment for a few days after area has cleared
- Store at room temperature

**Nasal route**

- Have patient clear nasal passages before administration; use decongestant if needed; shake inhaler, invert, tilt head backward, insert nozzle into nostril, away from septum; hold other nostril closed and depress activator, inhale through nose, exhale through mouth

## ADVERSE EFFECTS

**CNS:** *Depression,* headache, mood changes
**CV:** *Hypertension,* circulatory collapse, embolism, tachycardia, edema
**EENT:** Fungal infections, increased intraocular pressure, blurred vision
**GI:** *Diarrhea, nausea, abdominal distention,* GI hemorrhage, *increased appetite,* pancreatitis
**HEMA:** Thrombocytopenia
**INTEG:** Acne, poor wound healing, ecchymosis, petechiae
**MS:** Fractures, osteoporosis, weakness

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO, IM) |
| **Distribution** | Crosses placenta, widely distributed |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidney, breast milk |
| **Half-life** | 2-5 hr, adrenal suppression 3-4 days |

### Pharmacodynamics

| | PO | IM | TOPICAL | INH | INTRANASAL |
|---|---|---|---|---|---|
| **Onset** | Unknown | Unknown | Min to hr | 1-2 wk | Unknown |
| **Peak** | 1-2 hr | 1-2 hr | Hr to days | Unknown | 2-3 wk |
| **Duration** | 3 days | Unknown | Hr to days | Unknown | Unknown |

T

## INTERACTIONS

### Individual drugs

Alcohol, amphotericin B, cycloSPORINE, digoxin, indomethacin, quinolones: increased side effects

Ambenonium, isoniazid, neostigmine, somatrem: decreased effects of each specific product

Cholestyramine, colestipol, ePHEDrine, phenytoin, rifampin, theophylline: decreased action of triamcinolone

Indomethacin, ketoconazole: increased action of triamcinolone

### Drug classifications

Anticholinesterases, anticoagulants, anticonvulsants, antidiabetics, salicylates: decreased effects of each specific product

Antidiabetic agents: increased need for antidiabetic agents

Antiinfectives (macrolide), carBAMazepine, contraceptives (oral), estrogens, salicylates: increased action of triamcinolone

Barbiturates: decreased action of triamcinolone

Diuretics, salicylates: increased side effects

Toxoids, vaccines: decreased effects of toxoids, vaccines

### Drug/herb

Aloe, cascara sagrada, senna: increased hypokalemia

### Drug/lab test

Increased: cholesterol, sodium, blood glucose, uric acid, calcium, urine glucose

Decreased: calcium, potassium, $T_4$, $T_3$, thyroid $^{131}I$ uptake test, urine 17-OHCS, 17-KS

False negative: skin allergy tests

## NURSING CONSIDERATIONS

### Assessment

- Monitor potassium, blood glucose, urine glucose while on long-term therapy; hypokalemia and hyperglycemia
- Monitor weight daily; notify prescriber of weekly gain >5 lb; I&O ratio; be alert for decreasing urinary output and increasing edema
- Monitor B/P q4hr, pulse; notify prescriber if chest pain occurs
- Monitor plasma cortisol levels during long-term therapy (normal level 138-635 nmol/L [SI units] when measured at 8 AM); adrenal function periodically for hypothalamic-pituitary-adrenal axis suppression
- Assess for infection: increased temp, WBC even after withdrawal of medication; product masks infection symptoms
- Assess for potassium depletion: paresthesias, fatigue, nausea, vomiting, depression, polyuria, dysrhythmias, weakness
- Assess mental status: affect, mood, behavioral changes, aggression
- Assess nasal passages during long-term treatment for changes in mucus (nasal)
- Monitor temp; if fever develops, product should be discontinued
- Assess for systemic absorption: increased temp, inflammation, irritation (topical)
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cleft lip/palate has occurred (1st trimester), cautious use in breastfeeding, excreted in breast milk
- **Beers:** Avoid in older adults with or at high risk of delirium, monitor for confusion, delirium

### Patient/family education

- Advise patient that emergency ID as corticosteroid user should be carried/worn; not to discontinue abruptly, taper dose
- Instruct patient to notify prescriber if therapeutic response decreases; dosage adjustment may be needed
- Caution patient to avoid OTC products: salicylates, alcohol in cough products, cold preparations unless directed by prescriber; to avoid live vaccines
- Advise patient on all aspects of product use including cushingoid symptoms
- Teach patient symptoms of adrenal insufficiency: nausea, anorexia, fatigue, dizziness, dyspnea, weakness, joint pain
- Teach patient that long-term therapy may be needed to clear infection (1-2 mo depending on type of infection)

**Inhalation route**

- Teach patient proper administration technique; to wash inhaler with warm water and dry after each use
- Teach patient all aspects of product use including cushingoid symptoms

**Topical route**

- Instruct patient to avoid sunlight on affected area; burns may occur

**Nasal route**

- Instruct patient to clear nasal passages if sneezing attack occurs, repeat dose
- Advise patient to continue using product even if mild nasal bleeding occurs; is usually transient
- Teach patient method of instillation after providing written instruction from manufacturer

### Evaluation

**Positive therapeutic outcome**

- Decrease in runny nose (nasal)
- Decreased dyspnea, wheezing, dry crackles on auscultation (inh)
- Ease of respirations, decreased inflammation

• Absence of severe itching, patches on skin, flaking (topical)

## triamcinolone nasal agent

*See Appendix B*

## triamcinolone topical

*See Appendix B*

**⚠ HIGH ALERT**

## triazolam (Rx)

(trye-az′oh-lam)

**Apo-Triazo ✱, Gen-Triazolam ✱, Halcion**

*Func. class.:* Sedative-hypnotic, antianxiety

*Chem. class.:* Benzodiazepine, short acting

**Controlled substance schedule IV (USA), targeted (CDSA IV) (Canada)**

**Do not confuse:** Halcion/Haldol/halcinonide

**ACTION:** Produces CNS depression at limbic, thalamic, hypothalamic levels of CNS; may be mediated by neurotransmitter; γ-aminobutyric acid (GABA); results are sedation, hypnosis, skeletal muscle relaxation, anticonvulsant activity, anxiolytic action

**Therapeutic outcome:** Decreased anxiety, insomnia

**USES:** Insomnia (short-term), sedative/hypnotic

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity to benzodiazepines

**Precautions:** Children <15 yr, geriatric, anemia, renal/hepatic disease, suicidal individuals, product abuse, psychosis, acute closed-angle glaucoma, seizure disorders, angioedema, respiratory disease, depression, sleep-related behaviors (sleep walking), intermittent porphyria, myasthenia gravis, Parkinson's disease

**BLACK BOX WARNING:** Coadministration with other CNS depressants, respiratory depression

## DOSAGE AND ROUTES

**Adult:** PO 0.125-0.5 mg at bedtime, max 0.5 mg/day

**Geriatric:** PO 0.0625-0.125 mg at bedtime, max 0.25 mg/day

**Available forms:** Tabs 0.125, 0.25 mg

### Implementation

• Give with food or milk to decrease GI symptoms; if patient is unable to swallow medication whole, tab may be crushed and mixed with food or fluid

• Give sugarless gum, hard candy, frequent sips of water for dry mouth

## ADVERSE EFFECTS

**CNS:** *Headache, lethargy, drowsiness, daytime sedation,* dizziness, confusion, light-headedness, anxiety, irritability, amnesia, poor coordination, complex sleep-related reactions (sleep driving, sleep eating)

**CV:** Chest pain, pulse changes, ECG changes

**GI:** Nausea, vomiting, diarrhea, heartburn, abdominal pain, constipation, hepatic injury

**SYST:** Severe allergic reactions

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed, crosses placenta, crosses blood-brain barrier |
| **Metabolism** | Liver |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 1.5-5.5 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 15-30 min |
| **Peak** | Unknown |
| **Duration** | 6-8 hr |

## INTERACTIONS

### Individual drugs

**BLACK BOX WARNING:** Alcohol: increased action of both products

Cimetidine, clarithromycin, disulfiram, erythromycin, isoniazid, probenecid: increased effects; do not use concurrently

Rifampin: decreased action of rifampin

Theophylline: decreased effects of theophylline

### Drug classifications

Antacids: decreased effects of antacids

Antiinfectives (clarithromycin): increased effects

CNS depressants: increased effects of both products

Contraceptives (oral): increased effects; do not use concurrently

CYP3A4 inhibitors, protease inhibitors: increased triazolam levels

Smoking: decreased hypnotic effects

### Drug/food

Grapefruit may increase action, avoid concurrent use

T

### Drug/herb
Chamomile, hops, kava, lavender, valerian: increased CNS depression

### Drug/lab test
Increased: AST, ALT, serum bilirubin
Decreased: radioactive iodine uptake
False increase: 17-OHCS

## NURSING CONSIDERATIONS
### Assessment
• Assess patient's mental status: mood, sensorium, anxiety, affect, sleeping pattern, drowsiness, dizziness, especially geriatric; physical dependency, withdrawal symptoms: anxiety, panic attacks, agitation, seizures, headache, nausea, vomiting, muscle pain, weakness; suicidal tendencies; for indications of increasing tolerance and abuse
• Monitor patient's B/P (lying, standing), pulse; if systolic B/P drops 20 mm Hg, hold product, notify prescriber
• Monitor blood tests: CBC during long-term therapy; blood dyscrasias have occurred rarely; decreased hematocrit, neutropenia may occur
• Monitor liver function tests: AST, ALT, bilirubin, creatinine LDH, alkaline phosphatase
• Monitor I&O ratio; indicate renal dysfunction
• **Beers:** Avoid use in older adults, increased sensitivity to benzodiazepine and decreased metabolism, may cause or worsen delirium
• Severe allergic reactions: May occur any time during use

**BLACK BOX WARNING:** Respiratory depression: May occur more frequently with coadministration of other CNS depressants, monitor respirations often

• **Pregnancy/breastfeeding:** Do not use in pregnancy, not recommended in breastfeeding

### Patient/family education
• Advise patient that product may be taken with food or fluids, and tab may be crushed or swallowed whole
• Caution patient not to use for everyday stress or longer than 3 mo unless directed by prescriber; not to take more than prescribed amount; may be habit forming; not to double doses or skip doses

**BLACK BOX WARNING:** Instruct patient to avoid OTC preparations unless approved by prescriber; alcohol and CNS, sedatives, hypnotics depressants will increase CNS depression

• Caution patient to avoid driving, activities that require alertness because drowsiness may occur; to avoid alcohol ingestion or other psychotropic medications; to rise slowly or fainting may occur, especially geriatric; that drowsiness may worsen at beginning of treatment
• Teach patient to use reliable contraception
• Teach patient that complex sleep-related behaviors (sleep eating/driving) may occur
• Advise patient not to discontinue medication abruptly after long-term use; withdrawal symptoms include vomiting, cramping, tremors, seizures; decrease dosage by 50% q2nights until 0.125 mg for 2 nights, then stop

### Evaluation
**Positive therapeutic outcome**
• Decreased anxiety, restlessness, sleeplessness (short-term treatment only)

## TREATMENT OF OVERDOSE:
Lavage, VS, supportive care

## trifluridine ophthalmic
*See Appendix B*

**RARELY USED**

## trimethobenzamide (Rx)
(trye-meth-oh-ben'za-mide)
**Tigan**
*Func. class.:* Antiemetic, anticholinergic
*Chem. class.:* Ethanolamine derivative

**ACTION:** Acts centrally by blocking chemoreceptor trigger zone, which in turn acts on vomiting center

**Therapeutic outcome:** Absence of nausea and vomiting

**USES:** Nausea, vomiting, prevention of postoperative vomiting

## CONTRAINDICATIONS
Children (parenterally), hypersensitivity to opioids, shock

**Precautions:** Pregnancy, children, geriatric, cardiac dysrhythmias, acute febrile illness, encephalitis, gastroenteritis, dehydration, electrolyte imbalances, Reye's syndrome

## DOSAGE AND ROUTES
### Postoperative vomiting
**Adult:** IM 200 mg followed by a second dose 1 hr later

### Nausea/vomiting
**Adult:** PO 300 mg tid-qid; IM 200 mg tid-qid

### Renal dose
**Adult:** IM CCr 15-30 ml/min give 50% of dose

**Available forms:** Caps 300 mg; inj 100 mg/ml

### Implementation

**PO route**

• Cap may be swallowed whole or opened and mixed with food or fluids

**IM route**

• Administer IM inj in large muscle mass; aspirate to avoid **IV** administration

• Patient should remain lying down for 30 min after IM inj

**Syringe compatibilities:** Glycopyrrolate, HYDROmorphone, midazolam, nalbuphine

## ADVERSE EFFECTS

**CNS:** *Drowsiness,* headache, dizziness, confusion, *vertigo,* EPS, disorientation, coma, seizures, depression

**CV:** Hyper/hypotension, palpitations, cardiac dysrhythmias

**EENT:** Dry mouth, blurred vision, photosensitivity

**GI:** Nausea, diarrhea, vomiting, difficulty swallowing

**INTEG:** Rash, urticaria, fever, chills, flushing, hyperpyrexia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys |
| **Half-life** | Unknown |

### Pharmacodynamics

| | PO | IM | RECT |
|---|---|---|---|
| **Onset** | 20-40 min | 15 min | 10-40 min |
| **Peak** | Unknown | Unknown | Unknown |
| **Duration** | 3-4 hr | 2-3 hr | 3-4 hr |

## INTERACTIONS

### Individual drugs

Alcohol: increased effect

### Drug classifications

CNS depressants: increased effect

## NURSING CONSIDERATIONS

### Assessment

• Monitor VS, B/P; check patients with cardiac disease more often

• Assess for signs of toxicity of other products or masking of symptoms of disease: brain tumor, intestinal obstructions

• Observe for drowsiness, dizziness

• Assess for nausea, vomiting before and after treatment

### Patient/family education

• Teach patient to use good oral hygiene; frequent rinsing of mouth, sugarless gum for dry mouth

• Caution patient to avoid hazardous activities until product response is determined; drowsiness may occur

• Inform patient that orthostatic hypotension occurs often and to rise from sitting or lying position gradually; avoid hot tubs, hot showers, and tub baths because hypotension may occur

• Advise patient to remain lying down after IM inj for at least 30 min

• Inform patient that in hot weather, heat stroke may occur; take extra precautions to stay cool

• Teach patient to avoid OTC preparations (cough, hay fever, cold) unless approved by prescriber, serious product interactions may occur; avoid use with alcohol, CNS depressants, increased drowsiness may occur

• Teach patient about EPS

• Instruct patient to report sore throat, malaise, fever, bleeding, mouth sores; if these occur, CBC should be performed and product discontinued

### Evaluation

**Positive therapeutic outcome**

• Decreased nausea, vomiting

## triptorelin (Rx)

(trip-toe′rel-in)

**Trelstar, Trelstar Depot, Trelstar LA**

*Func. class.:* Gonadotropin-releasing hormone antagonist

*Chem. class.:* Synthetic decapeptide analog of LHRH

**ACTION:** Inhibitor of pituitary gonadotropin secretion; initially increases LH and FSH, with increases in testosterone, reduction in sex steroid levels

**Therapeutic outcome:** Decreased signs/symptoms of advanced prostate cancer

**USES:** Advanced prostate cancer

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity to this product or other LHRH agonists or LHRH

**Precautions:** Metastatic vertebral lesions, urinary tract obstruction, spinal cord compression, renal disease

## DOSAGE AND ROUTES

**Adult:** IM 3.75 mg q4wk; 11.25 mg q12wk, 22.5 mg q24wk

**Available forms:** Microgranules, depot inj 3.75 mg, 11.25 mg

### Implementation
- Give IM using implant, inserted by qualified person
- Use syringe with 20-G needle, withdraw 2 ml of sterile water for inj, inject into vial, shake well, withdraw vial contents, inject immediately

## ADVERSE EFFECTS
**CNS:** Headache, insomnia, dizziness, lability, fatigue
**CV:** *Hypertension,* peripheral edema
**ENDO:** Gynecomastia, breast tenderness, hot flashes
**GI:** Nausea, vomiting, diarrhea
**GU:** Impotence, urinary retention, UTI
**INTEG:** Rash, pain on injection, pruritus, hypersensitivity
**MISC:** Anaphylaxis, angioedema
**MS:** Osteoneuralgia

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | CYP450 |
| **Excretion** | Liver, kidneys |
| **Half-life** | 3 hr |

### Pharmacodynamics
Unknown

## INTERACTIONS
### Drug/lab test
Increased: alk phos, estradiol, FSH, LH, testosterone levels
Decreased: testosterone levels, progesterone

## NURSING CONSIDERATIONS
### Assessment
- **Assess for severe hypersensitivity:** discontinue product and give antihistamines, have emergency equipment nearby
- Monitor I&O ratios; palpate bladder for distention in urinary obstruction
- Monitor for relief of bone pain (back pain)
- Assess levels of testosterone and PSA
- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education
- Teach patient that gynecomastia may occur but will decrease after treatment is discontinued
- Advise patient to report allergic reaction immediately
- Teach patient that disease flare may occur at beginning of therapy

### Evaluation
**Positive therapeutic outcome**
- More normal levels of PSA, acid phosphatase, alkaline phosphatase, testosterone level of <25 ng/dl, tumor response

## trospium (Rx)
(trose′pee-um)
**Sanctura, Sanctura XR**
*Func. class.:* Anticholinergic, overactive bladder product, urinary antispasmodic
*Chem. class.:* Muscarinic receptor antagonist

**ACTION:** Relaxes smooth muscles in bladder by inhibiting acetylcholine effect on muscarinic receptors

**Therapeutic outcome:** Absence of bladder distention, nocturia, frequency, urgency, incontinence

**USES:** Overactive bladder (urinary frequency, urgency)

## CONTRAINDICATIONS
Hypersensitivity, uncontrolled closed-angle glaucoma, urinary retention, gastric retention, myasthenia gravis

**Precautions:** Pregnancy, breastfeeding, children, renal/hepatic disease, controlled closed-angle glaucoma, ulcerative colitis, intestinal atony, bladder outflow obstruction

## DOSAGE AND ROUTES
**Adult:** PO 20 mg bid, give 5 ml ≥1 hr prior to meals or on empty stomach ER 60 mg qAM

### Renal dose
**Adult:** PO CCr < 30 ml/min 20 mg/day at bedtime
**Geriatric ≥75 yr:** PO titrate down to 20 mg/day based on response and tolerance

**Available forms:** Tabs 20 mg caps ER 60 mg

### Implementation
- Take 1 hr before meals or on empty stomach

## ADVERSE EFFECTS
**CNS:** Fatigue, dizziness, headache, confusion
**CV:** Tachycardia
**EENT:** Dry eyes, vision abnormalities
**GI:** Flatulence, abdominal pain, *constipation, dry mouth,* dyspepsia
**GU:** Urinary retention, UTI
**INTEG:** Dry skin, angioedema
**MISC:** Heat stroke, fever

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed (10%) |
| **Distribution** | Protein bound (50%-85%) |
| **Metabolism** | Not fully understood in humans; extensively metabolized |
| **Excretion** | Urine (6%), feces (85%); excreted in urine by active tubular secretion |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Alcohol: increased drowsiness

MetFORMIN, procainamide, quiNIDine, ranitidine, tenofovir, triamterene, vancomycin: increased or decreased action of trospium

### Drug classifications

CNS depressants: increased drowsiness

Products excreted by active renal secretion (aMILoride, digoxin, morphine): increased or decreased action of trospium

### Drug/food

High-fat meal: decreased absorption

## NURSING CONSIDERATIONS

### Assessment

- **Assess urinary patterns:** distention, nocturia, frequency, urgency, incontinence, voiding patterns
- **Beers:** Avoid in older adults with or at high risk for delirium
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excreted in limited amount in breast milk

### Patient/family education

- Advise patient to avoid hazardous activities; dizziness may occur
- Caution patient that alcohol may increase drowsiness
- Inform patient about anticholinergic effects that may occur
- Teach patient to avoid all other products unless approved by prescriber

### Evaluation

#### Positive therapeutic outcome

- Correction of urinary status: absence of dysuria, frequency, nocturia, incontinence

T

tacrolimus (PO, IV) (Rx)
tamoxifen (Rx)
tasimelteon
teduglutide
telmisartan (Rx)
temsirolimus (Rx)
terazosin (Rx)
terbutaline (Rx)
teriparatide (Rx)
testosterone enanthate (Rx)
testosterone pellets (Rx)
testosterone buccal (Rx)

tetracaine ophthalmic
tetrahydrozoline nasal agent
thiamine (vitamin $B_1$) (PO, OTC; IV, IM, Rx)
tiaGABine (Rx)
tigecycline (Rx)
tinidazole (Rx)
tipranavir (Rx)
tobramycin (Rx)
tofacitinib
tolterodine (Rx)
topotecan (Rx)
trametinib
travoprost ophthalmic
tretinoin (vitamin A acid, retinoic acid) (Rx)
triamcinolone nasal agent
trifluridine ophthalmic
trospium (Rx)

tacrolimus (topical) (Rx)
tamsulosin (Rx)
tavaborole topical
telavancin (Rx)
temazepam (Rx)
tenecteplase (TNK-tPA) (Rx)
terbinafine (Rx)
terconazole vaginal antifungal
tesamorelin
testosterone undecanoate
testosterone transdermal (Rx)
testosterone topical solution (Rx) Gel
tetracaine topical
tetrahydrozoline ophthalmic
thioridazine (Rx)

ticagrelor
timolol (Rx)
tioconazole vaginal antifungal
tirofiban (Rx)
tobramycin ophthalmic
tolcapone (Rx)
tolvaptan (Rx)
toremifene (Rx)
trandolapril (Rx)
traZODone (Rx)
tretinoin topical

triamcinolone topical
trimethobenzamide (Rx)

tadalafil (Rx)
tapentadol (Rx)
tazobactam
telbivudine (Rx)
temozolomide (Rx)
tenofovir (Rx)
terbinafine topical
teriflunomide
testosterone (Rx)
testosterone cypionate (Rx)
testosterone gel (Rx)
testosterone nasal gel

tetracycline (Rx)
theophylline (Rx)
thyroid USP (desiccated) (Rx)

ticlopidine (Rx)
timolol ophthalmic
tiotropium (Rx)
tiZANidine (Rx)
tocilizumab (Rx)
tolnaftate topical
topiramate (Rx)
traMADol (Rx)
trastuzumab (Rx)
treprostinil (Rx)
triamcinolone (Rx)

triazolam (Rx)
triptorelin (Rx)

## ulipristal (Rx)

(ue'li-pris'tal)
**Ella**
*Func. class.:* Progesterone agonist/antagonist-abortifacient

**ACTION:** Binds to the progesterone receptor and prevents progesterone from occupying the receptor, postpones follicular rupture when taken immediately prior to ovulation

**Therapeutic outcome:** Absence of pregnancy

**USES:** Emergency contraception

## CONTRAINDICATIONS

Pregnancy, children/infants/neonates, postmenopausal females

**Precautions:** History of ectopic pregnancy, HIV

## DOSAGE AND ROUTES

**Adult/adolescent females:** PO 30 mg (1 tab) as soon as possible within 120 hr (5 days) of unprotected intercourse or a known or suspected contraceptive failure

**Available forms:** Tab 30 mg

### Implementation

- Administer without regard to food
- Store at room temperature, protect from light

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, fatigue
**GI:** Nausea, vomiting, abdominal pain
**GU:** Dysmenorrhea, breakthrough bleeding
**INTEG:** Acne vulgaris

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding >94% |
| **Metabolism** | Metabolized by CYP3A4 |
| **Excretion** | Unknown |
| **Half-life** | Terminal half-life 27-38 hrs |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Bosentan, carBAMazepine, felbamate, griseofulvin, OXcarbazepine, phenytoin, rifampin, St. John's wort, topiramate, bexarotene, dexamethasone, etravirine, flutamide, metyrapone, modafinil, nafcillin, nevirapine, pioglitazone, rifabutin, itraconazole, ketoconazole: decreased effect of ulipristal

Aldesleukin, IL-2, amiodarone, atazanavir, basiliximab, chloramphenicol, cimetidine, clarithromycin, dalfopristin, danazol, darunavir, delavirdine, diltiazem, dronedarone, erythromycin, fluconazole, FLUoxetine, fluvoxaMINE, imatinib, isoniazid, lapatinib, nefazodone, nelfinavir, niCARdipine, octreotide, pantoprazole, quinupristin, ranolazine, saquinavir, tamoxifen, telithromycin, tipranavir, verapamil, voriconazole, zafirlukast: increased ulipristal effect and adverse reactions

Aprepitant, fosaprepitant, efavirenz, fosamprenavir, quiNINE, ritonavir: increased or decreased ulipristal effect

### Drug classifications

Regular hormonal contraceptive methods: decreased contraceptive action

CYP3A4 inducers, barbiturates: decreased effect of ulipristal

CYP3A4 inhibitors: increased ulipristal effect and adverse reactions

### Drug/herb

St. John's wort: decreased effect of ulipristal

## NURSING CONSIDERATIONS

### Assessment

- **Assess need for emergency contraception,** pregnancy planned or suspected, obtain pregnancy test before use (pregnancy)
- Assess medications taken, many drug interactions may occur

### Patient/family education

- Instruct patient that if vomiting occurs within 3 hours of taking the tablet, consider repeating the dose
- Advise patient to report to provider any side effects
- Explain reason for medication and expected results
- Advise patient to avoid use in breastfeeding

### Evaluation

**Positive therapeutic outcome**

- Absence of pregnancy

## undecylenic acid topical

*See Appendix B*

## unoprostone ophthalmic

*See Appendix B*

ulipristal (Rx)

undecylenic acid topical

unoprostone ophthalmic

## valACYclovir (Rx)

(val-a-sye'kloh-vir)
**Valtrex**
*Func. class.:* Antiviral
*Chem. class.:* Synthetic acyclic purine nucleoside analog

**Do not confuse:** valACYclovir/valGANciclovir, Valtrex/Valcyte

**ACTION:** Interferes with DNA synthesis by conversion to acyclovir, causing decreased viral replication, time of lesional healing

**Therapeutic outcome:** Absence of itching, painful lesions; crusting and healing of lesions

**USES:** Treatment or suppression of herpes zoster (shingles), recurrent genital herpes, herpes labialis (cold sores), varicella, varicella-zoster

**Unlabeled uses:** Prevention of CMV infection in advanced HIV, posttransplant patients, Bell's palsy, herpes simplex virus prophylaxis

## CONTRAINDICATIONS

Hypersensitivity to this product, acyclovir, valGANciclovir

**Precautions:** Pregnancy, breastfeeding, geriatric, renal/hepatic disease, electrolyte imbalance, dehydration, hypersensitivity to penciclovir, famciclovir, ganciclovir, varicella

## DOSAGE AND ROUTES

### Genital herpes (suppressive initial)

**Adult:** PO 1 g bid × 10 days initially

### Genital herpes (recurrent episodes)

**Adult:** PO 500 mg bid × 3 days

### Genital herpes (suppressive therapy)

**Adult:** PO 1 g/day with normal immune function; 500 mg/day for those with ≤9 recurrences/yr; 500 mg bid in HIV-infected patients with CD4 ≥100

### Reduction of transmission

**Adult:** PO 500 mg/day for source partner

### Herpes zoster (shingles)

**Adult:** PO 1 g tid × 1 wk

### Herpes labialis

**Adult:** PO 2 g bid × 1 day at first sign of lesions

### Varicella (chickenpox) in immunocompetent patients

**Adolescent and child ≥2 yr:** PO 20 mg/kg/dose tid × 5 days, max 3 g/day; start at first sign, preferably within 24 hr of rash

### Renal dose

**Adult:** PO CCr 30-49 ml/min 1g q12hr (herpes zoster); 1 g q12hr × 1 day (herpes labialis); CCr 10-29 ml/min 1 g q24hr (genital herpes/herpes zoster); 500 mg q24hr (recurrent genital herpes); CCr <10 ml/min 500 mg q24hr (genital herpes/herpes zoster), 500 mg q24hr (recurrent genital herpes)

**Available forms:** Tabs 500, 1000 mg

### Implementation

- Give within 72 hr of outbreak (herpes zoster); as soon as possible (herpes labialis, genital herpes)
- Give orally before infection occurs
- Store at room temp; protect from light, moisture

## ADVERSE EFFECTS

**CNS:** Tremors, lethargy, *dizziness, headache, weakness,* depression
**ENDO:** *Dysmenorrhea*
**GI:** *Nausea, vomiting, diarrhea, abdominal pain, constipation,* increased AST
**HEMA:** Thrombocytopenic purpura, hemolytic uremic syndrome
**INTEG:** *Rash*
**MISC:** Dehydration

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Crosses placenta, enters breast milk, protein binding 13.5%-17.9% |
| **Metabolism** | Converts to acyclovir |
| **Excretion** | Urine, as acyclovir |
| **Half-life** | 2½-3½ hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Cimetidine, probenecid: increased blood levels of valACYclovir (only if renal disease is significant)

### Drug/lab test

Increased: LFTs, creatinine
Decreased: WBC, platelets

## NURSING CONSIDERATIONS

### Assessment

- **Assess for signs of infection;** characteristics of lesions; therapy should be started at first sign of herpes and is most effective within 72 hr of outbreak
- Assess C&S before product therapy; product may be given as soon as culture is performed,

V

lesion must be unroofed to obtain specimen; repeat C&S after treatment; determine the presence of other STDs
- Assess bowel pattern before, during treatment
- Assess for skin eruptions: rash
- Assess allergies before treatment, reaction of each medication
- Assess for thrombocytopenic purpura, hemolytic uremic syndrome, may be fatal
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excreted in breast milk

### Patient/family education
- Advise patient to take as prescribed; if dose is missed, take as soon as remembered up to 2 hr before next dose; do not double dose, without regard to meals
- Instruct patient to take product orally before infection occurs; product should be taken when itching or pain occurs, usually before eruptions
- Inform patient that partners need to be told that patient has herpes; they can become infected; condoms must be worn to prevent reinfections
- Tell patient that product does not cure infection, just controls symptoms and does not prevent infection to others
- Teach patient to report CNS changes (tremors, weakness, lethargy) immediately

### Evaluation
**Positive therapeutic outcome**
- Absence of itching, painful lesions; crusting and healed lesions

## valGANciclovir (Rx)
(val-gan-sy'kloh-veer)
**Valcyte**
*Func. class.:* Antiviral
*Chem. class.:* Synthetic nucleoside

**Do not confuse:** valGANciclovir/valACYclovir, Valcyte/Valtrex

**ACTION:** valGANciclovir is metabolized to ganciclovir; inhibits replication of human CMV in vivo and in vitro by selectively inhibiting viral DNA synthesis

**Therapeutic outcome:** Decreased proliferation of virus responsible for CMV retinitis

**USES:** Cytomegalovirus (CMV) retinitis in immunocompromised persons, including those with AIDS, after indirect ophthalmoscopy confirms diagnosis; prevention of CMV in transplantation; prevention of CMV in patients at risk going through transplant (kidney, heart, pancreas)

## CONTRAINDICATIONS
Breastfeeding, hypersensitivity to ganciclovir or valACYclovir, absolute neutrophil count $<500/mm^3$, platelet count $<25{,}000/mm^3$, hemodialysis, liver transplant

**Precautions:** Children, geriatric, renal function impairment, hypersensitivity to acyclovir, penciclovir, famciclovir

**BLACK BOX WARNING:** Preexisting cytopenias, secondary malignancy, infertility, anemia, pregnancy

## DOSAGE AND ROUTES
### Treatment of CMV
**Adult:** PO induction 900 mg bid × 21 days with food; maintenance 900 mg/day with food

### Transplant (CMV prophylaxis)
**Adult/adolescent >16 yr:** PO 900 mg/day with food starting within 10 days before transplantation until 100 days after transplantation
**Infant ≥4 mo/child/adolescent ≤16 yr:** PO give within 10 days of heart/kidney transplant; calculate dose as 7 × BSA × CCr and give a single daily dose

### Renal dose
CCr ≥60 ml/min same dosage as above; CCr 40-59 ml/min 450 mg bid × 21 days, then 450 mg/day; CCr 25-39 ml/min 450 mg/day × 21 days, then 450 mg q2day; CCr 10-24 ml/min 450 mg q2day, then 450 mg 2 ×/week

**Available forms:** Tabs 450 mg; powder for oral sol 50 mg/ml

### Implementation
**PO tab**
- Give with food for better absorption, avoid getting on skin, do not break, crush, or chew tab

**Oral SOL**
- Measure 9 ml of purified water in graduated cylinder, shake bottle to loosen powder, add ½ liquid, shake well, add remaining water, shake, remove child-resistant cap and push bottle adapter into neck of bottle, close with cap, give using the dispenser provided
- Store liquid in refrigerator; do not freeze; throw away any unused portion after 49 days

## ADVERSE EFFECTS
**CNS:** *Fever,* chills, coma, *confusion,* abnormal thoughts, dizziness, bizarre dreams, *headache,* psychosis, tremors, somnolence, *paresthesia, weakness,* seizures, insomnia
**EENT:** Retinal detachment in CMV retinitis
**GI:** *Abnormal liver function tests, nausea, vomiting, anorexia, diarrhea, abdominal pain,* hemorrhage

**GU:** Hematuria, increased creatinine, BUN
**HEMA:** Granulocytopenia, thrombocytopenia, irreversible neutropenia, anemia, eosinophilia
**INTEG:** *Rash,* alopecia, *pruritus,* urticaria, pain at inj site, phlebitis, Stevens-Johnson syndrome
**MISC:** Local and systemic infections and sepsis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed from GI tract |
| **Distribution** | Plasma protein binding unknown; crosses blood-brain barrier, CSF |
| **Metabolism** | Rapidly metabolized in intestinal wall and liver to ganciclovir |
| **Excretion** | Kidneys (ganciclovir) |
| **Half-life** | 3-4½ hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-3 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Adriamycin, amphotericin B, cycloSPORINE, dapsone, DOXOrubicin, flucytosine, pentamidine, trimethoprim/sulfamethoxazole, vinBLAStine, vinCRIStine: increased toxicity
Didanosine: increased effect; monitor for adverse effects, toxicity
Imipenem/cilastatin: increased seizures
Mycophenolate: increased effect of both drugs
Probenecid: decreased renal clearance of valGANciclovir
Radiation, zidovudine: severe granulocytopenia; do not coadminister

### Drug classifications

Antineoplastics, immunosuppressants: increased severe granulocytopenia; do not coadminister
Nucleoside analogs, other: increased toxicity

### Drug/food

Absorption: increased with high-fat meal

### Drug/lab test

Increased: creatinine
Decreased: RBC/WBC, Hct/Hgb

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Assess for leukopenia/neutropenia/thrombocytopenia:** WBCs, platelets q2day during 2 ×/day dosing and then qwk

**BLACK BOX WARNING: Malignancy:** monitor for malignancy; avoid accidental exposure of broken, crushed tabs, powder for solution; if these were in contact with skin, wash well with soap and water

- Assess serum creatinine or CCr ≥q2wk
- Assess for CMV retinitis by ophthalmoscopy before beginning treatment and q2wk

### Patient/family education

- Inform patient that product does not cure condition, that regular ophthalmologic and blood tests are necessary
- Caution patient that major toxicities may necessitate discontinuing product

**BLACK BOX WARNING: Pregnancy:** Caution patient to use contraception during treatment and that infertility may occur; men should use barrier contraception for 90 days after treatment, do not breastfeed

- Teach patient to increase fluid intake, report decreased urinary output
- Instruct patient to take with food, avoid high-fat meals
- Instruct patient to report seizures, dizziness; to avoid hazardous activities
- Caution patient to use sunscreen to prevent burns

### Evaluation

**Positive therapeutic outcome**
- Decreased symptoms of CMV

## TREATMENT OF OVERDOSE:

Maintain adequate hydration; dialysis may help reduce serum concentrations; consider use of hematopoietic growth factors

## valproate (Rx)

(val-proh'ate)
**Depacon**
## valproic acid (Rx)
**Depakene**
## divalproex sodium (Rx)
**Depakote, Depakote ER, Epival**
*Func. class.:* Anticonvulsant, vascular headache suppressant
*Chem. class.:* Carboxylic acid derivative

**ACTION:** Increases levels of γ-aminobutyric acid (GABA) in the brain, which decreases seizure activity

**Therapeutic outcome:** Decreased symptoms of epilepsy, bipolar disorder

**USES:** Simple (petit mal), complex (petit mal), absence, mixed seizures, manic episode associated with bipolar disorder, prophylaxis of migraine, adjunct in schizophrenia, tardive dyskinesia, aggression in children with ADHD, organic brain syndrome, tonic-clonic (grand mal)/myoclonic seizures

**Unlabeled uses:** Rectal for seizures (valproic acid)

## CONTRAINDICATIONS

Hypersensitivity, urea cycle disorders, mitochondrial disease, hepatic disease

**Precautions:** Breastfeeding, geriatric abrupt discontinuation, carnitine deficiency, coagulopathy, head trauma, organic brain syndrome, HIV, renal disease, suicidal ideation, surgery, thrombocytopenia

**BLACK BOX WARNING:** Children <2 yr, contraception requirements, hepatotoxicity, pancreatitis, pregnancy

## DOSAGE AND ROUTES

### For monotherapy or adjunct treatment of simple absence seizures, complex absence seizures, or complex partial seizures, and adjunctively for other seizure types that include absence or partial complex seizures (tonic-clonic seizures, myoclonic seizures)

**Adult, adolescent, and child 10 yr and older: PO/IV:** Initially, 10-15 mg/kg/day, increase by 5-10 mg/kg/day qwk, max 60 mg/kg/day

### For the treatment of acute mania associated with bipolar disorder, with or without psychotic features

**Adult: PO** (delayed-release divalproex [Depakote] or delayed-release valproic acid [Stavzor]): Initially, 750 mg/day in divided doses, then increase as rapidly as possible to the lowest effective dose that produces the desired clinical effect, max 60 mg/kg/day; **PO** (extended-release divalproex; i.e., Depakote ER): Initially, 25 mg/kg/day, increase as rapidly as possible to achieve the desired clinical effect. Consider a reduced initial dosage and slower dose titration in geriatric adults, max 60 mg/kg/day

### For migraine prophylaxis

**Adult ≤ 65 yr: PO** (delayed-release divalproex [Depakote] or delayed-release valproic acid [Stavzor]): Initially, 250 mg bid, titrate as needed up to a max 500 mg bid; (extended-release divalproex; Depakote ER): Initially, 500 mg qday × 1 wk, then increasing to 1000 mg qday, max 1000 mg/day

**Available:** Valproic acid: caps 250 mg; syr 250 mg/5 ml del rel cap (Stavzor) 125 mg; divalproex: del rel tabs 125, 250, 500 mg; ext rel tabs 250, 500 mg; sprinkle caps 125 mg; valproate: inj 100 mg/ml

### Implementation

- Swallow tabs and caps whole; do not break, crush, or chew
- Sprinkle cap contents on food
- Give elixir alone; do not dilute with carbonated beverage; do not give syrup to patients on sodium restriction
- Give with food or milk to decrease GI symptoms

**IV route**

- Dilute dose with ≥50 ml $D_5W$, NS, LR
- Run over 60 min (20 mg/min)

## ADVERSE EFFECTS

**CNS:** *Sedation, drowsiness,* dizziness, headache, incoordination, depression, hallucinations, behavioral changes, tremors, aggression, weakness, coma, suicidal ideation
**CV:** Hypotension/hypertension, chest pain, palpitations, peripheral edema
**EENT:** Visual disturbances, taste perversion
**GI:** *Nausea, vomiting, constipation, diarrhea, dyspepsia,* anorexia, cramps, hepatic failure, pancreatitis, toxic hepatitis, stomatitis, weight gain, dry mouth
**GU:** Enuresis, irregular menses
**HEMA:** Thrombocytopenia, leukopenia, lymphocytosis, increased pro-time, bruising, epistaxis, pancytopenia
**INTEG:** *Rash,* alopecia, photosensitivity, dry skin
**META:** Hyperammonemia, SIADH
**RESP:** Dyspnea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Breast milk, crosses placenta, widely distributed, protein binding 90% |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | 6-16 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 15-30 min |
| **Peak** | 1-4 hr |
| **Duration** | 4-6 hr |

## INTERACTIONS

### Individual drugs

Abciximab, cefoperazone, cefoTEtan, eptifibatide, heparin, tirofiban: increased bleeding risk
Alcohol: increased CNS depression
Cimetidine: decreased metabolism of valproic acid
ChlorproMAZINE, erythromycin, felbamate: increased valproic acid level
Phenytoin: increased action of phenytoin
Warfarin: increased bleeding

### Drug classifications

Antidepressants (tricyclics), barbiturates: increased action
Antihistamines, barbiturates, MAOIs, opioids, sedative/hypnotics: increased CNS depression
Tricyclics: decreased seizure threshold

### Drug/lab test

Increased: LFTs, bleeding time, ammonia
Decreased: sodium
False positive: ketones, urine
Interference: thyroid function tests

## NURSING CONSIDERATIONS

### Assessment

- Monitor blood tests: Hct, Hgb, RBC, serum folate, ammonia, platelets, pro-time, PTT, vit D if on long-term therapy
- Monitor liver function tests: AST, ALT, bilirubin, creatinine, failure; monitor for fever, anorexia, vomiting, lethargy, jaundice of skin, eyes that may occur during treatment, those with organic brain disorders, mental retardation, child <2 yr
- Monitor blood levels: therapeutic level 50-125 mcg/ml
- **Assess seizure disorder:** location, aura, activity, duration; seizure precautions should be in place
- **Assess bipolar disorder:** mood, activity, sleeping, eating, behavior; suicidal thoughts/behaviors
- **Hyperammonemic encephalopathy:** can be fatal in those with urea cycle disorders (UCD); lethargy, confusion, coma, CV, respiratory changes; discontinue
- **Assess migraines:** frequency, intensity
- Overdose symptoms: heart block, coma

**BLACK BOX WARNING:** Assess for pancreatitis, may be fatal; may occur anytime during treatment or several months/years after discontinuing treatment

- **Beers:** Avoid in older adults unless safer alternative is not available, ataxia, impaired psychomotor function may occur

**BLACK BOX WARNING: Do not use in pregnancy (migraine prophylaxis), use only in pregnancy (epilepsy, manic episodes) if other alternatives are not available; major malformation may occur, enroll pregnant patients in the North American Antiepileptic Drug Pregnancy Registry 888-233-2334, cautious use in breastfeeding, excreted in breast milk**

### Patient/family education

- Teach patient that physical dependency may result from extended use
- Instruct patient to report immediately suicidal thoughts/behaviors
- Instruct patient to avoid driving, other activities that require alertness
- Advise patient not to discontinue medication quickly after long-term use; seizures may result

**BLACK BOX WARNING:** Advise patient to report visual disturbances, rash, diarrhea, light-colored stools, jaundice, protracted vomiting to prescriber

- Advise patient to use contraception while taking this product, to notify provider if pregnancy is planned or suspected
- Instruct patient to drink plenty of fluids

### Evaluation

**Positive therapeutic outcome**

- Decreased seizures

## valsartan (Rx)

(val-zar'tan)
**Diovan**
*Func. class.:* Antihypertensive
*Chem. class.:* Angiotensin II receptor antagonist (type $AT_1$)

**Do not confuse:** Diovan/Zyban

**ACTION:** Blocks the vasoconstrictor and aldosterone-secreting effects of angiotensin II; selectively blocks the binding of angiotensin II to the $AT_1$ receptor found in tissues

**Therapeutic outcome:** Decreased B/P

**USES:** Hypertension, alone or in combination, in patients >6 yr; HF, after MI with left ventricular dysfunction/failure in stable patients

## CONTRAINDICATIONS

Hypersensitivity, severe hepatic disease, bilateral renal artery stenosis

**BLACK BOX WARNING:** Pregnancy

**Precautions:** Breastfeeding, children, geriatric, HF, hypertrophic cardiomyopathy, aortic/mitral valve stenosis, CAD, angioedema, renal/hepatic disease, hypersensitivity to ACE inhibitors, hyperkalemia, hypovolemia, African descent

## DOSAGE AND ROUTES

### Hypertension (alone or in combination)

**Adult:** PO 80 or 160 mg/day alone or in combination with other antihypertensives, may increase to 320 mg HF Class II to IV
**Geriatric:** PO Adjust based on clinical response; may start with lower dose
**Child/adolescent 6-16 yr:** PO 1.3 mg/kg/day, max 40 mg/day

### HF

**Adult:** PO 40 mg bid, up to 60 mg bid

### Post MI

**Adult:** PO 20 mg bid as early as 12 hr after MI, may be titrated within 7 days to 40 mg bid, then titrate to maintenance of 160 mg bid

### Available forms: Tabs 80, 160, 320 mg

### Implementation

- Administer without regard to meals

## ADVERSE EFFECTS

**CNS:** *Dizziness, insomnia,* drowsiness, vertigo, headache, fatigue
**CV:** Angina pectoris, 2nd-degree AV block, cerebrovascular accident, hypotension, MI, dysrhythmias
**EENT:** Conjunctivitis
**GI:** Diarrhea, abdominal pain, nausea, hepatotoxicity
**GU:** Impotence, nephrotoxicity, renal failure
**HEMA:** *Anemia,* neutropenia
**META:** Hyperkalemia
**MISC:** Vasculitis, angioedema
**MS:** Cramps, myalgia, pain, stiffness
**RESP:** *Cough*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Bound to plasma proteins |
| **Metabolism** | Extensive |
| **Excretion** | Feces, urine, breast milk |
| **Half-life** | 9 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Up to 2 hr |
| **Peak** | 2-4 hr |
| **Duration** | 24 hr |

## INTERACTIONS

### Individual drugs

Aliskiren: do not use concurrently
Gemfibrozil, rifampin, ritonavir, telithromycin: increased valsartan levels
Lithium: increased effects of lithium

### Drug classifications

Diuretics (potassium-sparing, potassium supplements, ACE inhibitors): increased hyperkalemia
NSAIDs, salicylates: decreased antihypertensive effects

### Drug/herb

Ephedra, ma huang: decreased antihypertensive effect
Hawthorn: increased antihypertensive effect

### Drug/food

Decreased AUC by 40%
Salt substitutes with potassium: increased hyperkalemia

## NURSING CONSIDERATIONS

### Assessment

- Assess B/P (lying, sitting, standing), pulse q4hr; note rate, rhythm, quality periodically
- Monitor electrolytes: potassium, sodium, chloride; total $CO_2$
- **Assess for angioedema:** facial swelling, shortness of breath, edema in feet, legs daily
- Obtain baselines in renal, liver function tests before therapy begins
- Assess blood tests: BUN, creatinine, before treatment
- Monitor for edema in feet, legs daily
- Assess for skin turgor, dryness of mucous membranes for hydration status; correct volume depletion before initiating therapy
- **Overdose symptoms:** bradycardia or tachycardia, circulatory collapse

**BLACK BOX WARNING: Pregnancy/breastfeeding:** Do not use in pregnancy, may cause fetal death, do not breastfeed

### Patient/family education

- Teach patient not to take this product if breastfeeding or pregnant, or have had an allergic reaction to this product
- If a dose is missed, instruct patient to take as soon as possible, unless it is within an hour before next dose
- Advise patient to comply with dosage schedule, even if feeling better
- Teach patient to notify prescriber of fever, swelling of hands or feet, irregular heartbeat, chest pain, persistent cough

• Advise patient excessive perspiration, dehydration, diarrhea may lead to fall in blood pressure; consult prescriber if these occur
• Inform patient that product may cause dizziness, fainting; light-headedness may occur, maintain hydration
• Instruct patient to avoid potassium supplements and foods, salt substitutes
• Caution patient to rise slowly to sitting or standing position to minimize orthostatic hypotension; how to take B/P

**BLACK BOX WARNING:** Teach patient not to take this medication if pregnant or breastfeeding

### Evaluation

**Positive therapeutic outcome**
• Decreased B/P

## vancomycin

(van-koe-mye'sin)
**Vancocin**
*Func. class.:* Antiinfective—miscellaneous
*Chem. class.:* Tricyclic glycopeptide

**ACTION:** Inhibits bacterial cell wall synthesis, blocks glycopeptides

**Therapeutic outcome:** Bactericidal for the following organisms: staphylococci, streptococci, *Corynebacterium, Clostridium*

**USES:** *Actinomyces* sp., *Bacillus* sp., *Clostridium difficile, Clostridium* sp., *Enterococcus faecalis, Enterococcus faecium, Enterococcus* sp., *Lactobacillus* sp., *Listeria monocytogenes, Staphylococcus aureus* (MRSA), *Staphylococcus aureus* (MSSA), *Staphylococcus epidermidis, Staphylococcus* sp., *Streptococcus agalactiae* (group B streptococci), *Streptococcus bovis, Streptococcus pneumoniae, Streptococcus pyogenes* (group A beta-hemolytic streptococci), *Viridans streptococci;* may be effective against *Corynebacterium jeikeium, Corynebacterium* sp.; pseudomembranous colitis, staphylococcal enterocolitis, group A β-hemolytic streptococci, endocarditis prophylaxis for dental procedures, bacteremia, join/bone infections, osteomyelitis, pneumonia, septicemia

## CONTRAINDICATIONS

Hypersensitivity, previous hearing loss

**Precautions:** Pregnancy, breastfeeding, neonates, geriatric, renal disease

## DOSAGE AND ROUTES

### Serious staphylococcal infections (when other products are ineffective, including MRSA, diphtheroid organisms)

**Adult: IV** 500 mg (7.5 mg/kg) q6-8hr or 1 g (15 mg/kg) q12hr or 15-20 mg/kg q12hr
**Child: IV** 40-60 mg/kg/day divided q6-8hr
**Neonate: IV** 15 mg/kg initially followed by 10 mg/kg q8-24hr

### Pseudomembranous/staphylococcal enterocolitis

**Adult:** PO 125 mg qid × 10-14 days
**Child:** PO (unlabeled) 40 mg/kg/day divided q6hr × 7-10 days, max 2 g/day

### Staphylococcal Endocarditis prophylaxis for dental procedure

**Adult: IV** 2 g divided (500 mg q6hr or 1 g q12hr)
**Child: IV** 20 mg/kg over 1 hr; 1 hr before procedure

### Renal dose

**Adult:** IV 15-20 mg/kg loading dose in seriously ill; individualize all other doses

**Available forms:** Cap 125, 250 mg; powder for inj **IV** 500, 750 mg; vials 1, 5, 10 g; dextrose sol for inj 500 mg/100 ml, 750 mg/150 ml, 1 g/200 ml

### Implementation

• Give antihistamine if red man syndrome occurs: decreased B/P, flushing of neck, face; stop or slow infusion
• Give dose based on serum conc
• Give in equal intervals around the clock to maintain blood levels
• Store at room temp for up to 2 wk after reconstitution
• Have adrenaline, suction, tracheostomy set, endotracheal intubation equipment on unit; anaphylaxis may occur
• Provide adequate intake of fluids (2 L) to prevent nephrotoxicity

**PO route**
• Give without regard to food, swallow whole (only used for *Clostridium difficile*)

**Intermittent IV INF route**
• Give after reconstitution with 10 ml of sterile water for inj (500 mg/10 ml); further dilution is needed for **IV**, 500 mg/100 ml of 0.9% NaCl, $D_5W$ given as intermittent inf over 1 hr; decrease rate of inf if red man syndrome occurs

**Continuous IV INF route (unlabeled)**
• Reconstitute, then may inf 1-2 g in volume to give over 24 hr if intermittent **IV** route cannot be used

V

**Y-site compatibilities:** Acetylcysteine, acyclovir, alatrofloxacin, aldesleukin, alemtuzumab, alfentanil, allopurinol, alprostadil, amifostine, amikacin, amino acids injection, aminocaproic acid, amiodarone, amoxicillin-clavulanate, amsacrine, anidulafungin, argatroban, ascorbic acid injection, atenolol, atracurium, atropine, azithromycin, benztropine, bleomycin, bretylium, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, carmustine, caspofungin, cefpirome, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clarithromycin, clindamycin, codeine, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAUNOrubicin liposome, dexamethasone, dexmedetomidine, dexrazoxane, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doripenem, doxacurium, doxapram, DOXOrubicin, DOXOrubicin liposomal, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, eptifibatide, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, folic acid (as sodium salt), gallium, gemcitabine, gentamicin, glycopyrrolate, granisetron, HYDROmorphone, hydrOXYzine, ifosfamide, insulin, regular, irinotecan, isoproterenol, isosorbide, ketamine, labetalol, lactated Ringer's injection, lepirudin, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, meropenem, metaraminol, methyldopate, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, minocycline, mitoXANtrone, morphine, multiple vitamins injection, mycophenolate, nalbuphine, naloxone, nesiritide, netilmicin, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ofloxacin, ondansetron, oxacillin, oxaliplatin, oxytocin, PACLitaxel (solvent/surfactant), palonosetron, pamidronate, pancuronium, papaverine, PEMEtrexed, penicillin G potassium/sodium, pentamidine, pentazocine, PENTobarbital, perphenazine, PHENobarbital, phentolamine, phenylephrine, phytonadione, piritramide, polymyxin B, potassium acetate/chloride, procainamide, prochlorperazine, promethazine, propranolol, protamine, pyridoxine, quiNIDine, ranitidine, remifentanil, rifampin, Ringer's injection, riTUXimab, sodium acetate/bicarbonate/citrate, succinylcholine, SUFentanil, tacrolimus, teniposide, thiamine, thiotepa, tigecycline, tirofiban, TNA (3-in-1), tobramycin, tolazoline, TPN (2-in-1), trastuzumab, urapidil, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

## ADVERSE EFFECTS

**CNS:** Headache
**CV:** Cardiac arrest, vascular collapse (rare), hypotension, peripheral edema
**EENT:** *Ototoxicity, permanent deafness,* tinnitus, nystagmus
**GI:** Nausea, pseudomembranous colitis
**GU:** Nephrotoxicity: increased BUN, creatinine, albumin, fatal uremia
**HEMA:** Leukopenia, eosinophilia, neutropenia
**INTEG:** Chills, fever, rash, thrombophlebitis at inj site, urticaria, pruritus, necrosis (red man syndrome), skin/subcutaneous tissue disorders
**MS:** Back pain
**RESP:** Wheezing, dyspnea
**SYST:** Anaphylaxis, superinfection

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Poorly absorbed (PO), completely absorbed (**IV**) |
| **Distribution** | Widely distributed, crosses placenta |
| **Metabolism** | Liver |
| **Excretion** | PO, feces; **IV**, kidneys |
| **Half-life** | 4-8 hr |

### Pharmacodynamics

| | IV |
|---|---|
| **Onset** | Immediate |
| **Peak** | Inf end |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Acyclovir, adefovir, amphotericin B, capreomycin, CISplatin, colistin, cycloSPORINE, foscarnet, ganciclovir, methotrexate, pamidronate, IV pentamidine, polymyxin B, streptozocin, tacrolimus, zoledronic acid: increased ototoxicity or nephrotoxicity
Cholestyramine, colestipol, cidofovir: do not use concurrently
MetFORMIN: increased lactic acidosis

### Drug classifications

Aminoglycosides, cephalosporins, NSAIDs: increased ototoxicity or nephrotoxicity
Nodepolarizing muscle relaxants: increased neuromuscular effects

### Drug/lab test

Increased: BUN/creatinine, eosinophils
Decreased: WBC

## NURSING CONSIDERATIONS

### Assessment

- **Assess for infection:** WBC, urine, stools, sputum, wound characteristics, throughout treatment, obtain C&S before starting treatment
- **Nephrotoxicity** Monitor I&O ratio, BUN, creatinine; report hematuria, oliguria because nephrotoxicity may occur

• Monitor blood tests: WBC; serum levels; peak 1 hr after 1-hr inf 25-40 mg/L; trough before next dose 5-10 mg/L, especially in renal disease, no trough levels are needed for PO form
• **Pseudomembranous colitis:** Assess for watery or bloody diarrhea, abdominal cramps, fever, pus, mucus, nausea, dehydration, discontinue immediately
• Obtain C&S before product therapy; product may be given as soon as culture is performed
• Assess auditory function during, after treatment; hearing loss, ringing, roaring in ears; product should be discontinued
• Monitor B/P during administration; sudden drop may indicate red man syndrome
• Assess for signs of infection
• **Red man syndrome:** flushing of neck, face, upper body, arms, back; may lead to anaphylaxis, slow IV infusion to >1 hr
• **Pregnancy/breastfeeding:** Use only if clearly needed, no well-controlled studies, do not breastfeed, excreted in breast milk

### Patient/family education

• Teach patient aspects of product therapy: need to complete entire course of medication to ensure organism death (7-10 days); culture may be performed after completed course of medication
• Advise patient to report sore throat, fever, fatigue; could indicate superinfection
• Instruct patient that product must be taken in equal intervals around the clock to maintain blood levels

### Evaluation

**Positive therapeutic outcome**
• Absence of fever, sore throat
• Negative culture after treatment

## vardenafil (Rx)

(var-den'a-fil)
**Levitra, Staxyn**
*Func. class.:* Impotence agent
*Chem. class.:* Phosphodiesterase type 5 inhibitor

## ACTION:

Inhibits phosphodiesterase type 5 (PDE5); enhances erectile function by increasing the amount of cyclic GMP, which causes smooth muscle relaxation and increased blood flow into the corpus cavernosum

**Therapeutic outcome:** Erection

## USES:

Treatment of erectile dysfunction

## CONTRAINDICATIONS

Hypersensitivity, coadministration of α-blockers or nitrates, renal failure, congenital or acquired QT prolongation

**Precautions:** Pregnancy; not indicated for women, children, or newborns; hepatic impairment; retinitis pigmentosa; cardiovascular disease; anatomic penile deformities; sickle cell anemia; leukemia; multiple myeloma; bleeding disorders; active peptic ulceration; renal disease

## DOSAGE AND ROUTES

**Adult:** PO 10 mg, taken 1 hr before sexual activity, dose may be reduced to 5 mg or increased to a max of 20 mg; max dosing frequency is once/day; orally disintegrating tab 10 mg 60 min before sexual activity; do not use with potent CYP3A4 inhibitors
**Geriatric >65 yr:** PO 5 mg initially, titrate as needed/tolerated

### Hepatic dose (Child-Pugh B)

**Adult:** PO 5 mg, max 10 mg

### Concomitant medications

Ritonavir, max 2.5 mg q72hr; for indinavir, ketoconazole 400 mg/day and itraconazole 400 mg/day, max 2.5 mg/day; for ketoconazole 200 mg/day, itraconazole 200 mg/day and erythromycin, max 5 mg/day

**Available forms:** Tabs 2.5, 5, 10, 20 mg; orally disintegrating tab 10 mg

### Implementation

• Take approximately 1 hr before sexual activity; do not use more than once a day
• Orally disintegrating tabs are not interchangeable with film-coated tabs
• **Orally disintegrating tab:** place on tongue, allow to dissolve, do not use water

## ADVERSE EFFECTS

**CNS:** *Headache, flushing, dizziness, insomnia,* seizures, transient global amnesia
**CV:** Hypertension, MI, CV collapse, chest pain
**EENT:** Conjunctivitis, tinnitus, photophobia, diminished vision, glaucoma, hearing loss
**GU:** Abnormal ejaculation, priapism
**MISC:** Rash, GERD, GGTP increased, NAION (nonarteritic ischemic optic neuropathy), dyspepsia
**MS:** Myalgia, arthralgia, neck pain
**RESP:** Rhinitis, sinusitis, dyspnea, pharyngitis, epistaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapid; reduced absorption with high-fat meal |
| **Distribution** | Bioavailability 15%; protein binding 95% |
| **Metabolism** | Liver |
| **Excretion** | Primarily in feces (91%-95%) |
| **Half-life** | 4-5 hr |

V

### Pharmacodynamics

| | |
|---|---|
| **Onset** | 20 min |
| **Peak** | ½-1½ hr |
| **Duration** | <5 hr |

## INTERACTIONS

### Individual drugs

Alcohol, amLODIPine, metoprolol, NIFEdipine: increased hypotension, do not use concurrently

Cimetidine, erythromycin, itraconazole, ketoconazole: increased levels

Clarithromycin, droperidol, procainamide, quiNIDine: serious dysrhythmias; do not use concurrently

### Drug classifications

Do not use with nitrates because of unsafe decrease in B/P that could result in heart attack or stroke

α-Blockers, protease inhibitors: increased hypotension; do not use concurrently

Angiotensin II receptor blockers: increased hypotension; do not use concurrently

Antidysrhythmics class Ia, III, quinolones: serious dysrhythmias; do not use together

Antiretroviral protease inhibitors: increased vardenafil levels

### Drug/food

High-fat meal: decreased absorption

### Drug/lab test

Increase: CK

## NURSING CONSIDERATIONS

### Assessment

- Assess for use of organic nitrates that should not be used with this product
- Assess for severe loss of vision while taking this or any similar products; these products should not be used if vision loss has occurred

### Patient/family education

- Advise that product does not protect against STDs, including HIV
- Teach that product absorption is reduced with a high-fat meal
- Instruct that product should not be used with nitrates in any form
- Inform that product has no effect in the absence of sexual stimulation
- Teach that patient should seek immediate medical attention if erection lasts for more than 4 hr
- Advise to inform physician of all medications being taken
- Teach patient to notify prescriber immediately and stop taking product if vision loss occurs

### Evaluation

**Positive therapeutic outcome**

- Sustainable erection

## varenicline (Rx)

(var-e-ni′kleen)

**Champix, Chantix**

*Func. class.:* Smoking cessation agent

**ACTION:** Partial agonist for nicotine receptors; partially activates receptors to help curb cravings; occupies receptors to prevent nicotine binding

**Therapeutic outcome:** Smoking cessation

**USES:** Smoking deterrent

## CONTRAINDICATIONS

Hypersensitivity, eating disorders

**Precautions:** Pregnancy, breastfeeding, children <18 yr, geriatric, renal disease, recent MI, angioedema

**BLACK BOX WARNING:** Bipolar disorder, depression, schizophrenia, suicidal ideation

## DOSAGE AND ROUTES

### Smoking cessation

**Adult:** PO therapy should begin 1 week prior to smoking stop date (i.e., take product plus tobacco for 7 days); titrate for 1 wk, days 1 through 3, 0.5 mg/day; days 4 through 7, 0.5 mg bid; day 8 through end of treatment 1 mg bid; treatment is 12 wk and may repeat for another 12 wk

### Renal dose

**Adult:** PO CCr ≤50 ml/min, titrate to max 0.5 mg bid

**Available forms:** Tabs 0.5, 1 mg, Chantix continuing month PAK; Chantix starting month PAK

### Implementation

- Do not break, crush, or chew tabs
- Give increased fluids, bulk in diet if constipation occurs
- Give with a full glass of water after eating
- Give sugarless gum, hard candy, or frequent sips of water for dry mouth

## ADVERSE EFFECTS

**CNS:** Headache, agitation, dizziness, insomnia, abnormal dreams, fatigue, malaise, behavior changes, depression, suicidal ideation, suicide, amnesia, hallucinations, hostility, mania, psychosis, tremor

**CV:** Dysrhythmias, hypertension, palpitations, tachycardia, angina, hypotension, MI

**EENT:** *Blurred vision,* tinnitus
**GI:** *Nausea, vomiting,* anorexia, *dry mouth,* increased/decreased appetite, *constipation,* flatulence, GERD
**GU:** Erectile dysfunction, urinary frequency, menstrual irregularities
**INTEG:** Rash, pruritus, angioedema, Stevens-Johnson syndrome
**MISC:** Weight loss or gain
**MS:** Back pain, myalgia, *arthralgia*
**RESP:** Dyspnea, rhinorrhea

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Steady state 4 days |
| **Metabolism** | Minimal |
| **Excretion** | Urine 92%, unchanged |
| **Half-life** | Elimination 24 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 3-4 hr |
| **Duration** | 24 hr |

## NURSING CONSIDERATIONS

### Assessment

- **Assess smoking history:** motivation for smoking cessation, years used, amount each day, assess for smoking cessation after 12 wk; if progress has not been made, product may be used for an additional 12 wk
- Assess for renal function in geriatric

**BLACK BOX WARNING: Neuropsychiatric symptoms:** assess for mood, sensorium, affect, behavioral changes, agitation, suicidal ideation; suicide has occurred; possible worsening of depression, schizophrenia, bipolar disorder

- Angioedema/Stevens-Johnson syndrome: Rash during treatment, discontinue if rash, fever, fatigue, joint pain, lesions occur
- **Pregnancy/breastfeeding:** Not used in women

### Patient/family education

- Teach patient that treatment for smoking cessation lasts 12 wk and another 12 wk may be required
- Teach patient to use caution in driving, other activities requiring alertness; blurred vision may occur
- Advise patient to set a date to quit smoking and initiate treatment 1 wk prior to that date
- Teach patient how to titrate product
- Advise patient not to use with nicotine patches unless directed by prescriber; may increase B/P
- Advise patient to notify prescriber if pregnancy is suspected or planned
- Teach patient that vivid dreams, insomnia may occur during beginning of treatment, but usually subside
- To notify all prescribers of all OTC/Rx/herbs used

**BLACK BOX WARNING:** Instruct patient to notify prescriber immediately of change in thought/behavior (suicidal ideation, hostility, depression); stop product

### Evaluation

**Positive therapeutic outcome**
- Smoking cessation

**HIGH ALERT**

## vasopressin (Rx)

(vay-soe-press'in)
**Pressyn, Vasostrict**
*Func. class.:* Pituitary hormone
*Chem. class.:* Lysine vasopressin

**ACTION:** Promotes reabsorption of water by action on renal tubular epithelium; causes vasoconstriction on muscles in the GI system

**Therapeutic outcome:** Increased osmolality, decreased urine output in diabetes insipidus

**USES:** Diabetes insipidus (nonnephrogenic/nonpsychogenic), hypotension, postcardiotomy shock, septic shock

## CONTRAINDICATIONS

Hypersensitivity, chronic nephritis

**Precautions:** Pregnancy, breastfeeding, CAD, asthma, renal/vascular disease, migraines, seizures

## DOSAGE AND ROUTES

### Diabetes insipidus

**Adult:** IM/SUBCUT 5-10 units bid-qid prn; CONT **IV** INF 0.0005 units/kg/hr, (0.5 milliunit/kg/hr), double dose q30min as needed
**Child:** IM/SUBCUT 2.5-10 units bid-qid prn

### Hypotension in septic shock

**Adult:** IV 0.01 units/min, titrate by 0.005 units/min q10-15min until target B/P is achieved, to max 0.07 units/min after target B/P of 8 hr without use of catecholamines; taper 0.005 units/min qhr to maintain B/P

**Available forms:** Sol for inj 20 units/ml

### Implementation

**IM/SUBCUT route**
- May be given IM/SUBCUT for diagnosis of diabetes insipidus
- Give patient 16 oz water at administration to prevent nausea, vomiting, cramping

V

## ADVERSE EFFECTS

**CNS:** Drowsiness, headache, lethargy, flushing, vertigo
**CV:** Increased B/P, dysrhythmias, chest pain, cardiac arrest, shock, MI
**EENT:** Nasal irritation, congestion, rhinitis
**GI:** Nausea, heartburn, cramps, vomiting, flatus
**GU:** Vulval pain, uterine cramping
**MISC:** Tremor, sweating, vertigo, urticaria, bronchial constriction

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Erratically absorbed (IM) |
| **Distribution** | Widely distributed extracellular fluid |
| **Metabolism** | Liver, rapidly |
| **Excretion** | Kidneys, unchanged |
| **Half-life** | 10-20 min |

### Pharmacodynamics

| | IM | IV |
|---|---|---|
| **Onset** | 1 hr | Unknown |
| **Peak** | Unknown | Unknown |
| **Duration** | 3-8 hr | 3-8 hr |

## INTERACTIONS

### Individual drugs

CarBAMazepine, chlorproPAMIDE, clofibrate, fludrocortisone, urea: decreased antidiuretic effect
Demeclocycline, lithium: increased antidiuretic effect

### Drug classifications

Tricyclics: increased antidiuretic effect

## NURSING CONSIDERATIONS

### Assessment

- Assess intranasal use: nausea, congestion, cramps, headache; usually decreased with decreased dose
- Monitor pulse, B/P, ECG periodically during treatment, if using for CPR monitor continuously
- Monitor **Diabetes insipidus:** I&O ratio, weight daily, fluid/electrolyte balance, urine specific gravity check for edema in extremities; if water retention is severe, diuretic may be prescribed; check for water intoxication: lethargy, behavioral changes, disorientation, neuromuscular excitability
- Small doses may precipitate coronary adverse effects; keep emergency equipment nearby
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, breastfeeding women should pump and discard milk for 1.5 hr after receiving product

### Patient/family education

- Teach patient technique for nasal instillation: to insert tube into nasal cavity to instill product
- Caution patient to avoid OTC products for cough, hay fever because these preparations may contain EPINEPHrine, decrease product response; do not use with alcohol
- Advise patient to carry/wear emergency ID specifying therapy, disease process (diabetes insipidus)
- Teach patient to measure/record I&O
- Teach patient to avoid alcohol, all OTC medications unless approved by prescriber

### Evaluation

**Positive therapeutic outcome**

- Absence of severe thirst
- Decreased urine output, osmolality

## vedolizumab

(ve′-doe-liz′ue-mab)
**Entyvio**
*Func. class.:* Immunosuppressive, biologic response modifier

**ACTION:** A specific integrin receptor antagonist that inhibits the migration of specific memory T lymphocytes across the endothelium into inflamed gastrointestinal parenchymal tissue. The action reduces the chronic inflammatory process present in both ulcerative colitis and Crohn's disease

**Therapeutic outcome:** Lessening of ulcerative colitis and Crohn's disease

**USES:** For moderately to severely active ulcerative colitis/Crohn's disease; to reduce signs and symptoms, and to induce and maintain clinical remission in patients who have an inadequate response to conventional therapy

**CONTRAINDICATIONS:** Hypersensitivity

**Precautions:** Hepatic disease, infections, progressive multifocal leukoencephalopathy (PML), pregnancy, breastfeeding, live vaccines, TB, human antichimeric antibody (HACA)

## DOSAGE AND ROUTES

**Adult: IV** INF 300 mg; give over 30 min at weeks 0, 2, and 6 as induction therapy, then 300 mg q8wk

**Available forms:** Powder for injection 300 mg

### Implementation

- Full response is usually observed by 6 wk; those who do not respond by week 14 are unlikely to respond

• Give as IV infusion only, do not use as an IV push or bolus
• Make sure all immunizations are up to date
• Reconstitute with 4.8 ml of sterile water for injection, using a syringe with a 21- to 25-gauge needle
• Insert the syringe needle into the vial and direct the stream of sterile water for injection to the glass wall of the vial; gently swirl the solution for 15 sec; do not shake
• Allow the solution to stand for up to 20 min at room temperature to allow for reconstitution and for any foam to settle
• Once dissolved, product should be clear or opalescent, colorless to light brownish yellow, and free of visible particulates. Discard if discolored or if foreign particles are present.
• Before withdrawing solution from vial, gently invert vial 3 times. Withdraw 5 ml (300 mg) of reconstructed product using a 21- to 25-gauge needle. Discard remaining product.
• Add the 5 ml (300 mg) of reconstituted product to 250 ml of sterile 0.9% sodium chloride and gently mix infusion bag. Do not mix with other medications. Administer solution as soon as possible; if necessary, solution may be stored for up to 4 hr refrigerated; do not freeze. Infuse over 30 min; after infusion, flush line with 30 ml of sterile 0.9% sodium chloride injection. Discard any unused infusion solution.

## ADVERSE EFFECTS

**CNS:** Headache, fatigue, dizziness
**GI:** Nausea, vomiting
**MISC:** Rash, pruritus, infusion-related reactions
**MS:** Arthralgia, back pain
**SYST:** Anaphylaxis, progressive multifocal leukoencephalopathy (PML)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Antineoplastics, immunosuppressives: increased infection risk
Do not use with tumor necrosis factor (TNF) modifiers
Toxoids, vaccines: decreased immune response

## NURSING CONSIDERATIONS

### Assessment

• Ulcerative colitis/Crohn's disease: Monitor symptoms before and after treatment
• **Hypersensitivity:** Swelling of lips, tongue, throat, face, rash, wheezing, hypertension, if serious reactions occur discontinue product
• **Liver dysfunction:** Monitor for elevated hepatic enzymes, jaundice, malaise, nausea, vomiting, abdominal pain, and anorexia; these signs are predictive of severe liver injury that may be fatal or may require a liver transplant in some patients; if hepatic dysfunction is suspected, discontinue
• **Tuberculosis (TB) latent/active:** Obtain TB skin test both before and during treatment. Do not give in active infection such as influenza or sepsis.
• **Progressive multifocal leukoencephalopathy (PML):** Assess for increased weakness on one side of the body or clumsiness of limbs, visual disturbance, and changes in thinking, memory, and orientation leading to confusion and personality changes; severe disability or death can come over weeks or months
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excretion unknown

### Patient/family education

• Teach patient about the symptoms of infection and to report to health care provider immediately
• Advise patient to report planned or suspected pregnancy, or if breastfeeding
• Teach patient not to use live virus vaccines while taking this product, bring vaccinations up to date before starting product
• Teach patient to report allergic reactions, PML, teach symptoms

### Evaluation

**Positive therapeutic response**
• Lessening of ulcerative colitis and Crohn's disease

**⚠ HIGH ALERT**

## vemurafenib

(vem-ue-raf'e-nib)
**Zelboraf**
*Func. class.:* Biologic response modifiers; signal transduction inhibitors (STIs)

**ACTION:** Inhibitor of some mutated forms of BRAF serine threonine kinase, thereby

V

blocking cellular proliferation in melanoma cells with the mutation. It also inhibits other kinases including CRAF, ARAF, wild-type BRAF, SRMA, ACK1, MAP4H5, and FGR. It is a potent adenosine triphosphate-competitive inhibitor of RAFs with a modest preference for mutant BRAF and CRAF as compared with wild-type BRAF.

**Therapeutic outcome:** Decreased spread of malignancy

**USES:** Unresectable or metastatic malignant melanoma with V600E mutation of the BRAF gene

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, infants, neonates, hepatic disease, QT prolongation, secondary malignancy, torsades de pointes, hypokalemia, hypomagnesium, sunlight exposure

## DOSAGE AND ROUTES

**Adult: PO** 960 mg (4 tabs) bid about q12h

**Dose adjustments for toxicity due to symptomatic adverse reactions or QTc prolongation for Grade 1 or tolerable Grade 2 adverse events:**
No dosage change

**For intolerable Grade 2 or Grade 3 adverse events (1st episode):**
Interrupt treatment until toxicity resolves to grade ≤1; when resuming, reduce dosage to 720 mg (3 tabs) bid

**For intolerable Grade 2 or Grade 3 adverse events (2nd episode):**
Interrupt treatment until toxicity resolves to grade ≤1; when resuming, reduce dose to 480 mg (2 tabs) bid

**For intolerable Grade 2 or Grade 3 adverse events (3rd episode)**
Discontinue treatment permanently

**For Grade 4 adverse events (1st episode):**
Discontinue permanently or interrupt until toxicity resolves to grade ≤1; when resuming, reduce dose to 480 mg (2 tablets) bid

**For Grade 4 adverse events (2nd episode):**
Discontinue permanently

**Available forms:** Tab 240 mg

### Implementation

- Continue until disease progresses or unacceptable toxicity occurs
- Missed doses can be taken up to 4 hr before the next dose is due; take about 12 hr apart; take without regard to meals
- Swallow whole with a full glass of water; do not crush or chew
- Store at room temperature in original container

## ADVERSE EFFECTS

**CNS:** Asthenia, *fatigue,* fever, dizziness, headache, muscle paralysis, peripheral neuropathy
**CV:** Atrial fibrillation, hypotension, *peripheral edema,* QT prolongation
**EENT:** Blurred vision, iritis, photophobia, uveitis
**GI:** Constipation, decreased appetite, diarrhea, dysgeusia, nausea, vomiting, weight loss, hepatotoxicity
**INTEG:** Actinic keratosis, *alopecia,* hyperkeratosis, *maculopapular rash,* palmar-plantar erythrodysesthesia (hand and foot syndrome), papular rash, *photosensitivity,* pruritus, xerosis/dry skin
**MS:** *Arthralgia,* arthritis, back pain, extremity pain, musculoskeletal pain, *myalgias*
**RESP:** Cough
**SYST:** Anaphylaxis, secondary malignancy, Stevens-Johnson syndrome, toxic epidermal necrolysis, drug reaction with eosinophilia/anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 99% |
| **Metabolism** | Unknown |
| **Excretion** | 94% feces |
| **Half-life** | 30-120 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Abarelix, alfuzosin, amoxapine, apomorphine, arsenic trioxide, asenapine, chloroquine, ciprofloxacin, citalopram, clarithromycin, cloZAPine, cyclobenzaprine, dasatinib, dolasetron, dronedarone, droperidol, eribulin, erythromycin, ezogabine, flecainide, fluconazole, gatifloxacin, gemifloxacin, grepafloxacin, halofantrine, haloperidol, iloperidone, indacaterol, lapatinib, levofloxacin, levomethadyl, lopinavir/ritonavir, magnesium sulfate, maprotiline, mefloquine, methadone, moxifloxacin, nilotinib, norfloxacin, octreotide, ofloxacin, OLANZapine, ondansetron, paliperidone, palonosetron, pentamidine, pimozide, posaconazole, potassium sulfate, probucol, propafenone, QUEtiapine, quiNIDine,

ranolazine, rilpivirine, risperiDONE, saquinavir, sodium, sparfloxacin, SUNItinib, tacrolimus, telavancin, telithromycin, tetrabenazine, troleandomycin, vardenafil, vemurafenib, venlafaxine, vorinostat, ziprasidone: increased QT prolongation, torsades de pointes

### Drug classifications

β-agonists, Class IA antiarrhythmics (disopyramide, procainamide, quiNIDine), Class III antiarrhythmics (amiodarone, dofetilide, ibutilide, sotalol), halogenated anesthetics, local anesthetics, certain phenothiazines (chlorproMAZINE, fluPHENAZine, mesoridazine, perphenazine, prochlorperazine, thioridazine and trifluoperazine), tricyclic antidepressants: increased QT prolongation, torsades de pointes

CYP3A4 inducers (alcohol, barbiturates, bexarotene, carBAMazepine, erythromycin, etravirine, fluvoxaMINE, ketoconazole, metyrapone, modafinil, nevirapine, OXcarbazepine, phenytoin, rifabutin, rifampin, ritonavir): decreased vemurafenib effect

CYP3A4/CYP1A2 inhibitors (cimetidine, dalfopristin, delavirdine, enoxacin, indinavir, isoniazid, itraconazole, quinupristin, tipranavir): increased vemurafenib effect

### Drug/lab test

Alkaline phosphatase, bilirubin, LFTs, serum creatinine: increase

## NURSING CONSIDERATIONS

### Assessment

- **Hepatic disease:** Liver function test (LFT) abnormalities, altered bilirubin levels, may occur during treatment; monitor LFTs and bilirubin levels prior to treatment, then monthly; more frequent testing is needed in those presenting with grade 2 or greater toxicities; Laboratory alterations should be managed with dose reduction, treatment interruption, or discontinuation
- **QT prolongation:** has been reported with the use of crizotinib; therefore, crizotinib should be avoided in patients with QT prolongation; Monitor ECG and electrolytes in those with congestive heart failure, bradycardia, electrolyte imbalance (hypokalemia, hypomagnesemia), or in those who are taking concomitant medications known to prolong the QT interval; treatment interruption, dosage adjustment, treatment discontinuation may be needed in those who develop QT prolongation
- **Pregnancy/breastfeeding:** Identify if pregnancy is planned or suspected, do not use in pregnancy avoid breastfeeding
- Serum electrolytes, CCR, bilirubin, ECG
- **BRAF testing:** Obtain testing before use, do not use in wild-type *BRAF*, confirm *BRAF* V600E mutation
- **Skin reactions:** Assess for cuSCC skin reactions

### Patient/family education

- Teach patient/family that missed doses can be taken up to 4 hr before the next dose is due to maintain the twice-daily regimen, if vomiting occurs, do not retake dose, take next scheduled dose
- Teach patient to use reliable contraception; both women and men of childbearing age should use adequate contraceptive methods during therapy and for at least 90 days after completing treatment, pregnancy
- Teach patient to notify provider of new skin lesions
- Advise patient to avoid sun exposure, wear sunscreen, protective clothing

### Evaluation

**Positive therapeutic outcome**

- Decreased spread of malignancy

**⚠ HIGH ALERT**

**RARELY USED**

## venetoclax

(veh-neh′toh-klax)

**Venclexta**

*Func. class.:* Antineoplastic, signal transduction inhibitor

**USES:** Treatment of CLL in patients with a 17p deletion who have received at least one prior therapy

## CONTRAINDICATIONS

Hypersensitivity, pregnancy

## DOSAGE AND ROUTES

**Adult: PO** initially 20 mg qday × 7 days, increase dose qwk × 5 wk: wk 2, 50 mg/day; wk 3, 100 mg/day; wk 4, 200 mg/day; wk 5 and beyond, 400 mg/day. Continue therapy until disease progression. A dose reduction and/or therapy interruption may be necessary in patients who develop toxicity

## venlafaxine (Rx)

(ven-la-fax′een)

**Effexor, Effexor XR**

*Func. class.:* Second-generation SNRI antidepressant—miscellaneous

**Do not confuse:** Effexor/Effexor XR/Enablex

V

**ACTION:** Potent inhibitor of neuronal serotonin and norepinephrine uptake, weak inhibitor of dopamine; no muscarinic, histaminergic, or α-adrenergic receptors in vitro

**Therapeutic outcome:** Relief of depression

**USES:** Prevention/treatment of major depression, to treat depression at end of life; long-term treatment of generalized anxiety disorder, panic disorder, social anxiety disorder (Effexor XR only)

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, geriatric, mania, recent MI, cardiac/renal/hepatic disease, seizure disorder, hypertension, eosinophilic pneumonia, desvenlafaxine hypersensitivity

**BLACK BOX WARNING:** Children, suicidal ideation, bipolar disorder, interstitial lung disease

## DOSAGE AND ROUTES

### Depression

**Adult:** PO 75 mg/day in 2 or 3 divided doses; taken with food, may be increased to 150 mg/day; if needed may be further increased to 225 mg/day; increments of 75 mg/day should be made at intervals of no less than 4 days; some hospitalized patients may require up to 375 mg/day in 3 divided doses; EXT REL 37.5-75 mg PO daily, max 225 mg/day; give Effexor XR daily

### Anxiety disorders

**Adult:** PO 75 mg/day or 37.5 mg/day × 4-7 days initially, max 225 mg/day

### Hepatic dose

**Adult:** PO moderate impairment 50% of dose

### Renal dose

**Adult:** PO CCr 10-70 ml/min reduce dose by 25%-50%; CCr <10 ml/min reduce by 50%

### Hot flashes (unlabeled)

**Adult (male, prostate cancer):** PO 12.5 mg bid × 4 wk

**Adult female:** PO 37.5-75 mg/day

**Available forms:** Tabs scored (Effexor) 25, 37.5, 50, 75, 100 mg; ext rel caps (Effexor XR) 37.5, 75, 150, 225 mg

### Implementation

- Give with food or milk for GI symptoms
- Crush if patient is unable to swallow medication whole
- Store at room temperature; do not freeze

## ADVERSE EFFECTS

**CNS:** *Emotional lability, dizziness, weakness,* apathy, ataxia, headache, tremors, hypertonia, euphoria, hallucinations, hostility, insomnia, anxiety, suicidal ideation in children/adolescents, seizures, neuroleptic malignant syndrome–like reaction, anxiety, abnormal dreams, paresthesia

**CV:** Angina pectoris, extrasystoles, postural hypotension, syncope, thrombophlebitis, hypertension, tachycardia, change in QTc interval, increased cholesterol

**EENT:** *Abnormal vision,* taste, *ear pain*

**GI:** *Dysphagia, eructation,* colitis, gastritis, gingivitis, *constipation,* stomatitis, stomach and mouth ulceration, nausea, anorexia, dry mouth, *abdominal pain, vomiting, weight loss*

**GU:** *Anorgasmia,* abnormal ejaculation, urinary frequency, decreased libido, impotence, menstrual changes

**HEMA:** Thrombocytopenia, leukocytosis, leukopenia, abnormal bleeding

**INTEG:** Ecchymosis, acne, alopecia, brittle nails, dry skin, photosensitivity, sweating, angioedema (ext rel), Stevens-Johnson syndrome

**META:** *Peripheral edema, weight loss,* edema, glycosuria, hyperlipemia, hypokalemia

**MS:** Arthritis, bone pain, tenosynovitis, arthralgia

**RESP:** *Bronchitis, dyspnea,* cough

**SYST:** Neonatal abstinence syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Widely distributed, 27% protein binding |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys, 87% |
| **Half-life** | 5 hr, 11 hr (active metabolite) |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression
Cimetidine: increased venlafaxine effect
CloZAPine, desipramine, haloperidol, warfarin: increased levels of these products
Cyproheptadine: decreased venlafaxine effect
Indinavir: decreased effect of indinavir
Linezolid, methylene blue, sibutramine, SUMAtriptan, traMADol, traZODone, tryptophan: increased serotonin syndrome

### Drug classifications

Antihistamines, opioids, sedative-hypnotics: increased CNS depression
MAOIs: hyperthermia, rigidity, rapid fluctuations of vital signs, mental status changes, neuroleptic malignant syndrome

Salicylates, NSAIDs, platelet inhibitors, anticoagulants: increased bleeding risk
SSRIs, SNRIs, serotonin-receptor agonists: increased serotonin syndrome

### Drug/herb

Kava, valerian: increased CNS depression
St. John's wort: serotonin syndrome

### Drug/lab test

Increased: alkaline phosphatase, bilirubin, AST, ALT, BUN, creatinine, serum cholesterol, CPK, LDH
False positive: amphetamines, phencyclidine

## NURSING CONSIDERATIONS

### Assessment

- Monitor B/P (lying, standing), pulse q4hr; if systolic B/P drops 20 mm Hg hold product, notify prescriber; take vital signs q4hr in patients with CV disease
- Monitor blood tests: CBC, leukocytes, differential, cardiac enzymes if patient is receiving long-term therapy
- Monitor liver function tests: AST, ALT, bilirubin
- Check weight qwk; weight loss or gain; appetite may increase, peripheral edema may occur

**BLACK BOX WARNING:** Assess mental status: mood, sensorium, affect; increase in psychiatric symptoms: depression, panic; for suicidal ideation in children/adolescents, discuss with family members and in early treatment

- Monitor urinary retention, constipation; constipation is more likely to occur in children or geriatric
- **Assess for withdrawal symptoms:** headache, nausea, vomiting, muscle pain, weakness; do not usually occur unless product was discontinued abruptly, taper over 14 days
- Identify alcohol consumption; if alcohol is consumed, hold dose
- **Serotonin syndrome, neuroleptic malignant syndrome:** assess for increased heart rate, shivering, sweating, dilated pupils, tremors, high B/P, hyperthermia, headache, confusion; if these occur, stop product, administer a serotonin antagonist if needed; usually worse if given with linezolid, methylene blue, tryptophan
- **Beers:** Use with caution in older adults, may exacerbate or cause syndrome of inappropriate antidiuretic hormone secretion
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, use in late 3rd trimester has resulted in neonatal complications, do not breastfeed, excreted in breast milk

### Patient/family education

- Advise patient to notify prescriber of rash, hives, or allergic reactions
- Teach patient that therapeutic effects may take 2-3 wk
- Teach patient to use caution in driving or other activities requiring alertness because of drowsiness, dizziness, blurred vision; to avoid rising quickly from sitting to standing, especially geriatric
- Teach patient to avoid alcohol ingestion, other CNS depressants

Serotonin syndrome, neuroleptic malignant syndrome: advise patient to report immediately shivering, sweating, tremors, fever, dilated pupils

- Advise patient to avoid pregnancy, breastfeeding while taking this product, birth defects have occurred when used in the 3rd trimester
- Teach patient that worsening of symptoms, suicidal thoughts/behavior may occur in children, young adults
- Advise patient to take as prescribed, contents of capsule may be sprinkled on applesauce if unable to swallow whole

### Evaluation

**Positive therapeutic outcome**

- Decreased depression, anxiety; sense of well-being
- Absence of suicidal thoughts

## TREATMENT OF OVERDOSE:

ECG monitoring, induce emesis, lavage, administer anticonvulsant

**⚠ HIGH ALERT**

## verapamil (Rx)

(ver-ap'a-mil)
**Apo-Verap, Calan, Calan SR, Chronovera, Covera, Covera-HS, Isoptin, Isoptin SR, Novo-Veramil, Tarka, Veramil, Verelan, Verelan PM**

*Func. class.:* Calcium-channel blocker; antihypertensive; antianginal, antidysrhythmic (Class IV)
*Chem. class.:* Diphenylalkylamine

**Do not confuse:** Covera-HS/Covairyx HS

**ACTION:** Inhibits calcium ion influx across cell membrane during cardiac depolarization; produces relaxation of coronary vascular smooth muscle, peripheral vascular smooth muscle; dilates coronary vascular arteries; decreases SA/AV node conduction; dilates peripheral arteries

V

**Therapeutic outcome:** Decreased angina pectoris, dysrhythmias, B/P

**USES:** Chronic stable vasospastic, unstable angina; dysrhythmias, hypertension, supraventricular tachycardia, atrial flutter or fibrillation

## CONTRAINDICATIONS

Sick sinus syndrome, 2nd- or 3rd-degree heart block, hypotension <90 mm Hg systolic, cardiogenic shock, severe HF, Lown-Ganong-Levine syndrome, Wolff-Parkinson-White syndrome

**Precautions:** Pregnancy, breastfeeding, children, geriatric, HF, hypotension, hepatic injury, renal disease, concomitant β-blocker therapy

## DOSAGE AND ROUTES

### Angina

**Adult:** PO 80-120 mg tid, increase qwk, max 480 mg/day

### Dysrhythmias

**Adult:** PO 240-320 mg/day in 3-4 divided doses in digitalized patients

**Adult: IV** BOL 5-10 mg (0.075-0.15 mg/kg) over 2 min, may repeat 10 mg (0.15 mg/kg) ½ hr after first dose

**Child 1-15 yr: IV** BOL 0.1-0.3 mg/kg over >2 min, repeat in 30 min, max 5 mg in a single dose

**Child 0-1 yr: IV** BOL 0.1-0.2 mg/kg over ≥2 min, may repeat after 30 min

### Hypertension

**Adult:** PO 80 mg tid, may titrate upward; EXT REL 120-240 mg/day as a single dose, may increase to 240-480 mg/day

### Hepatic dose/geriatric/compromised ventricular function

**Adult:** PO 40 mg tid initially, increase as tolerated

**Available forms:** Tabs 40, 80, 120 mg; ext rel tabs 120, 180, 240 mg; inj 2.5 mg/ml in ampules, syringes, vials; ext rel caps 100, 200, 240, 300 mg

### Implementation

**PO route**

- **Regular release:** give without regard to food
- **Extended release:** do not crush or chew ext rel products
- Cap may be opened and contents sprinkled on food; do not dissolve, chew cap
- Give once a day before meals at bedtime; sus rel give with food to decrease GI symptoms

**Direct IV route**

- Give by direct **IV** undiluted (Y-site, 3-way stopcock) over at least 2 min, or 3 min geriatric; discard unused sol; to prevent serious hypotension, patient should be recumbent for 1 hr or more, with continuous ECG and B/P monitoring
- Do not use IV with IV β-blockers, may cause AV nodal blockade

**Y-site compatibilities:** Alfentanil, amikacin, argatroban, ascorbic acid, atracurium, atropine, aztreonam, bivalirudin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, CARBOplatin, caspofungin, ceFAZolin, cefonicid, cefotaxime, cefoTEtan, cefOXitin, ceftizoxime, cefTRIAXone, cefuroxime, chlorproMAZINE, cimetidine, ciprofloxacin, clindamycin, cyanocobalamin, cyclophosphamide, cycloSPORINE, cytarabine, DACTINomycin, DAPTOmycin, dexamethasone, dexmedetomidine, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, DOPamine, doxacurium, DOXOrubicin hydrochloride, doxycycline, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, epoetin alfa, eptifibatide, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hydrALAZINE, hydrocortisone, HYDROmorphone, ifosfamide, imipenem/cilastatin, inamrinone, insulin, isoproterenol, ketorolac, labetalol, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, meperidine, metaraminol, methotrexate, methoxamine, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, miconazole, midazolam, milrinone, mitoXANtrone, morphine, multivitamins, nalbuphine, naloxone, nesiritide, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxaliplatin, oxytocin, PACLitaxel, palonosetron, papaverine, PEMEtrexed, penicillin G, pentamidine, pentazocine, phentolamine, phenylephrine, phytonadione, piperacillin/tazobactam, potassium chloride, procainamide, prochlorperazine, promethazine, propranolol, protamine, pyridoxine, quinupristin/dalfopristin, ranitidine, rocuronium, sodium acetate, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiamine, ticarcillin/clavulanate, tirofiban, tobramycin, tolazoline, trimethaphan, urokinase, vancomycin, vasopressin, vecuronium, vinCRIStine, vinorelbine, voriconazole

**Y-site incompatibilities:** Acyclovir, albumin, aminophylline, amphotericin B cholesteryl, amphotericin B colloidal, amphotericin B liposome, ampicillin, ampicillin/sulbactam, azaTHIOprine, cefoperazone, cefTAZidime, chloramphenicol, dantrolene, diazepam, diazoxide, ertapenem, fluorouracil, folic acid, furosemide, ganciclovir, indomethacin, pantoprazole, PENTobarbital, PHENobarbital, phenytoin, piperacillin/tazobactam, propofol, sodium bicarbonate,

thiotepa, tigecycline, trimethoprim/sulfamethoxazole

## ADVERSE EFFECTS

**CNS:** *Headache, drowsiness,* dizziness, anxiety, depression, weakness, asthenia, fatigue, insomnia, confusion, light-headedness
**CV:** *Edema,* HF, bradycardia, hypotension, palpitations, AV block, dysrhythmias
**GI:** *Nausea,* diarrhea, gastric upset, *constipation,* elevated liver function tests
**GU:** Impotence, nocturia, polyuria, gynecomastia
**HEMA:** Bruising, petechiae, bleeding
**INTEG:** Rash, bruising
**MISC:** Gingival hyperplasia
**SYST:** Stevens-Johnson syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO) |
| **Distribution** | Not known |
| **Metabolism** | Liver, extensively |
| **Excretion** | Kidneys (70%) |
| **Half-life** | Biphasic 4 min, 3-7 hr |

### Pharmacodynamics

| | PO | PO-EXT REL | IV |
|---|---|---|---|
| **Onset** | 1-2 hr | Unknown | 1-5 min |
| **Peak** | ½-1½ hr | 5-7 hr | 3-5 min |
| **Duration** | 3-7 hr | 24 hr | 2 hr |

## INTERACTIONS

### Individual drugs

CarBAMazepine, cycloSPORINE, digoxin, theophylline: increased levels of each specific product
Cimetidine, clarithromycin, erythromycin: increased effect of verapamil
FentaNYL, prazosin, quiNIDine: increased hypotension
Lithium: decreased lithium levels

### Drug classifications

Antihypertensive, β-adrenergic blockers, nitrates: increased effects of verapamil, monitor for CV effects
Nondepolarizing muscle relaxants: increased effect
NSAIDs: decreased antihypertensive effect

### Drug/herb

Ephedra (ma huang): increased hypertension
Ginseng, ginkgo: increased verapamil effect
St. John's wort: decreased verapamil effect

### Drug/food

Grapefruit juice: increased hypotension

### Drug/lab test

Increased: alkaline phosphatase, AST, ALT, BUN, creatinine, serum cholesterol

## NURSING CONSIDERATIONS

### Assessment

- **HF:** Assess fluid volume status: I&O ratio and record; weight; distended red veins; crackles in lung; color; quality, specific gravity of urine; skin turgor; adequacy of pulses; moist mucous membranes; bilateral lung sounds; peripheral pitting edema; dehydration symptoms of decreasing output, thirst, hypotension, dry mouth, and mucous membranes should be reported
- Monitor B/P and pulse, pulmonary capillary wedge pressure (PCWP), central venous pressure, index, often during inf; notify prescriber if <50 bpm, systolic B/P <90 mm Hg
- Monitor ALT, AST, bilirubin daily; if these are elevated, hepatotoxicity is suspected
- Monitor platelets; if <150,000/mm$^3$, product is usually discontinued and another product started
- Assess for extravasation; change site q48hr
- **Monitor cardiac status:** B/P, pulse, respiration, ECG
- Monitor renal/hepatic function tests during long-term treatment, serum potassium, periodically
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, avoid breastfeeding, excreted in breast milk
- **Beers:** Avoid use in older adults, may cause fluid retention or exacerbate heart failure

### Patient/family education

- Advise patient to increase fluids/fiber to counteract constipation
- Caution patient to avoid hazardous activities until stabilized on product and dizziness is no longer a problem
- Teach patient how to take pulse, B/P before taking product; to keep record or graph
- Instruct patient to limit caffeine consumption; to avoid alcohol, grapefruit, and OTC products unless directed by prescriber
- Advise patient to comply with medical regimen: diet, exercise, stress reduction, product therapy; to notify prescriber of irregular heartbeat, shortness of breath, swelling of feet and hands, pronounced dizziness, constipation, nausea, hypotension, **IV** calcium
- Teach patient to use as directed even if feeling better; may be taken with other CV products (nitrates, β-blockers)
- Caution patient not to discontinue abruptly; chest pain may occur
- **Stevens-Johnson syndrome:** Rash, fever, fatigue, joint pain, lesions, discontinue immediately

V

• Advise to report chest pain, palpitations, irregular heartbeats, swelling of extremities, skin irritation, rash, tremors, weakness
• Instruct patient to notify prescriber if pregnancy is planned; avoid breastfeeding

### Evaluation

**Positive therapeutic outcome**
• Decreased anginal pain
• Decreased dysrhythmias
• Decreased B/P

## TREATMENT OF OVERDOSE:
Defibrillation, atropine for AV block, vasopressor for hypotension, **IV** calcium

## vigabatrin (Rx)
(vye-ga'ba-trin)
**Sabril**
*Func. class.:* Anticonvulsant
*Chem. class.:* GABA transaminase inhibitor

**ACTION:** May inhibit reuptake and metabolism of GABA, may increase seizure threshold; structurally similar to GABA

**Therapeutic outcome:** Prevention of seizure activity

**USES:** Adjunct treatment of partial seizures in adults and children ≥12 yr, infantile spasm

## CONTRAINDICATIONS
Hypersensitivity to this product

**Precautions:** Pregnancy, breastfeeding, children <2 yr, geriatric patients, renal/hepatic disease, suicidal ideation/behavior, abrupt discontinuation

**BLACK BOX WARNING:** Visual disturbance, requires an experienced clinician

## DOSAGE AND ROUTES
### Partial seizures
**Adult/child ≥ 16 yr/child 10-16 yr, >60 kg:** PO 500 mg bid, titrate in 500-mg increments at weekly intervals, up to 1.5 g bid

### Infantile spasm
**Infant >1 mo, child ≤2 yr:** PO 50 mg/kg/day in 2 divided doses titrate in 25-50 mg/kg/day increments q3days, max 150 mg/kg/day

### Renal dose
**Adult:** PO CCr 50-80 ml/min, reduce dosage by 25%; PO CCr 30-49 ml/min, reduce dosage by 50%; PO CCr 10-29 ml/min, reduce dosage by 75%

**Available forms:** Powder for oral sol 500 mg; tablet 500 mg

### Implementation
**PO route (tab)**
• Give without regard to meals
**PO route (oral solution)**
• Reconstitute immediately before using
• Empty contents of appropriate number of packets into a clean cup
• For each packet, dissolve 10 ml of water, conc. 50 mg/ml; do not use other liquids
• Stir until dissolved; solution should be clear
• Use calibrated oral syringe to measure correct dosage
• Discard any unused solution

## ADVERSE EFFECTS
**CNS:** Headache, memory impairment, *dizziness,* irritability, lethargy, malignant hyperthermia, insomnia, suicidal ideation
**CV:** Edema
**EENT:** Vision impairment
**GI:** Nausea, vomiting, diarrhea, increased appetite, abdominal pain, GI bleeding, hemorrhoids, weight gain, constipation
**GU:** Impotence, dysmenorrhea
**HEMA:** Anemia
**INTEG:** Pruritus, rash
**RESP:** Coughing, respiratory depression, pulmonary embolism

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | >95% |
| **Distribution** | Widely; no protein binding |
| **Metabolism** | Not metabolized |
| **Excretion** | Urine 80% parent drug, slowed in renal disease |
| **Half-life** | 7.5 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2 hr |
| **Duration** | Unknown |

## INTERACTIONS
### Individual drugs
AzaTHIOprine, chloroquine, deferoxamine, ethambutol, hydroxychloroquine, interferons, loxapine, mecasermin, rh-IGF-1, pentostatin, tamoxifen, thiothixene: increased serious ophthalmic effects (glaucoma, retinopathy); avoid concurrent use

### Drug classifications
CNS depressants: increased CNS depression
Corticosteroids, phenothiazines, phosphodiesterase inhibitors: increased serious ophthalmic effects (glaucoma, retinopathy)

### Drug/lab test
Decreased: ALT/AST

## NURSING CONSIDERATIONS
### Assessment

**BLACK BOX WARNING:** Visual impairment: prescribers must be registered with the SHARE program due to risk of permanent vision loss; if no clinical response in 2-4 wk in pediatric patients or 3 mo in adults, provide vision assessment; assess again after ≤4 wk, at least q3mo, and 3-6 mo after stopping product

- Monitor renal studies: urinalysis, BUN, urine creatinine q3mo in those with renal disease
- Monitor hepatic studies: ALT, AST, bilirubin
- Assess description of seizures: location, duration, presence of aura
- Assess mental status: mood, sensorium, affect, behavioral changes; if mental status changes, notify prescriber
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, pregnant patient should enroll in the North American Antiepileptic Drug Pregnancy Registry 888-233-2334, do not breastfeed, excreted in breast milk
- **Beers:** Avoid in older adults unless safer alternatives are not available, may cause ataxia, impaired psychomotor function

### Patient/family education
- Teach patient to carry emergency ID stating patient's name, products taken, condition, prescriber's name and phone number
- Advise patient to avoid driving, other activities that require alertness
- Inform patient not to discontinue medication quickly after long-term use
- Instruct patient to notify prescriber if pregnancy is planned or suspected
- Instruct patient to report suicidal thoughts/behaviors immediately
- Teach patient to notify prescriber if pregnancy is planned or suspected, not to breastfeed

**BLACK BOX WARNING:** That drug may cause vision impairment, regular exams will be needed, notify prescriber at once if loss of vision occurs

- Instruct patient to avoid alcohol; drowsiness, dizziness may occur

### Evaluation
**Positive therapeutic outcome**
- Decreased seizure activity; document on patient's chart

## vilazodone (Rx)
(vil-az′oh-done)
**Viibryd**
*Func. class.:* Antidepressant
*Chem. class.:* SSRI, benzofuran

**ACTION:** A novel antidepressant unrelated to other antidepressants, enhances serotoninergic action by a dual mechanism

**Therapeutic outcome:** Remission of depressive symptoms

**USES:** Major depression

## CONTRAINDICATIONS
Concomitant use of MAOIs or within 14 days after discontinuing an MAOI or within 14 days after discontinuing vilazodone

**Precautions:** Abrupt discontinuation, bipolar disorder, bleeding, operating machinery, ECT, geriatrics, hepatic disease, hyponatremia, hypovolemia, infants, labor, pregnancy **C,** substance abuse, history of seizures, serotonin syndrome, neuroleptic malignant syndrome, use with serotonin precursors (e.g., tryptophan) or serotonergic drugs, suicidal ideation and worsening depression or behavior

**BLACK BOX WARNING:** Child, suicidal ideation

## DOSAGE AND ROUTES
### Major depressive disorder
**Adult:** PO 10 mg ×7 days, then 20 mg ×7 days, then 40 mg/day; if taking a potent CYP3A4 inhibitor, the max is 20 mg/day

**Available forms:** Tabs 10, 20, 40 mg

### Implementation
- Administer with food to increase absorption
- Store at room temperature, away from moisture, heat
- Do not use within 2 wk of MAOIs

## ADVERSE EFFECTS
**CNS:** Restlessness, dizziness, drowsiness, fatigue, mania, insomnia, migraine, neuroleptic malignant-like syndrome, paresthesias, seizures, suicidal ideation, tremor, night sweats, dream disorders
**CV:** Palpitations, ventricular extrasystole
**EENT:** Cataracts, blurred vision
**GI:** *Nausea,* vomiting, flatulence, *diarrhea, xerostomia,* altered taste, gastroenteritis, increased appetite
**GU:** Decreased libido, ejaculation disorder, increased frequency of urination, sexual dysfunction

**HEMA:** Bleeding, decreased platelets
**INTEG:** Sweating
**MS:** Arthralgia
**SYST:** Neonatal abstinence syndrome, withdrawal, serotonin syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 96-99% |
| **Metabolism** | Metabolized by the liver by CYP 3A4 (major) and CYP2C19 and CYP2D (minor) and non-CYP pathways |
| **Excretion** | Unknown |
| **Half-life** | 25 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 4-5 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Selegiline, busPIRone, dextromethorphan, fenfluramine, dexfluramine, linezolid, methylene blue lithium, meperidine, fentaNYL, methylphenidate, dexmethylphenidate, metoclopramide, mirtazapine, nefazodone, pentazocine, phenothiazines, haloperidol, loxapine, thiothixene, molindone: increased serotonin syndrome

### Drug classifications

MAO inhibitors: do not use within 2 wk of this product
SSRIs, SNRIs, serotonin receptor agonists, ergots, amphetamines: increased serotonin syndrome
Anticoagulants, NSAIDs, platelet inhibitors, salicylates, thrombolytics: increased bleeding
CYP3A4 inducers: decreased vilazodone effect
CYP3A4 inhibitors (clarithromycin, dronedarone, efavirenz, erythromycin, ketoconazole and others): increased vilazodone levels

### Drug/herb

St. John's wort: increased serotonin syndrome

### Drug/food

Grapefruit juice: avoid use

### Drug/lab test

Decreased: sodium

## NURSING CONSIDERATIONS

### Assessment

- Assess mental status: orientation, mood behavior initially and periodically.

**BLACK BOX WARNING:** Initiate suicide precautions if indicated

- Assess for history of seizures, mania
- Monitor renal, hepatic status: hyponatremia (confusion, weakness, headache); monitor serum sodium
- **Abrupt discontinuation:** do not discontinue abruptly; taper, monitor for symptoms of withdrawal; if intolerable, resume previous dose and decrease more slowly
- Serotonin syndrome nausea, vomiting, sedation, sweating, facial flushing, high B/P; discontinue product, notify prescriber
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, if used in 3rd trimester, fetal complications may occur, avoid breastfeeding, excreted in breast milk

### Patient/family education

- Teach patient to take as directed, with food, do not double doses, that follow-up will be needed
- Advise patient to avoid abrupt discontinuation unless approved by prescriber
- Instruct patient not to drive or operate machinery until effects are known
- Instruct patient not to use other products unless approved by prescriber, do not use alcohol
- Advise patient to contact prescriber if allergic reactions, personality changes (aggression, anxiety, anger, hostility), extreme sleepiness or drowsiness, confusion, nervousness, restlessness, clumsiness, numbness, tingling or burning pain in hands, arms, legs or feet, tremors, or having unusual behavior or thoughts about self-harm
- Instruct patient to notify prescriber if pregnancy is planned or suspected; avoid breastfeeding

**BLACK BOX WARNING:** Suicidal thoughts/behaviors: discuss with family the possibility of suicidal thoughts/behaviors, to notify prescriber immediately if these occur

- **Neuroleptic malignant syndrome:** Fever, change in mental status, seizures, rigidity, discontinue product, notify prescriber immediately

### Evaluation

**Positive therapeutic outcome**

- Remission of depressive symptoms

**⚠ HIGH ALERT**

## vinBLAStine (VLB) (Rx)

(vin-blast'een)
**Velbe** 🍁
*Func. class.:* Antineoplastic
*Chem. class.:* Vinca rosea alkaloid

**Do not confuse:** vinBLAStine/vinCRIStine/vinorelbine

**ACTION:** Inhibits mitotic activity, arrests cell cycle at metaphase; inhibits RNA synthesis, blocks cellular use of glutamic acid needed for purine synthesis; a vesicant

**Therapeutic outcome:** Prevention of rapid growth of malignant cells; immunosuppression

**USES:** Breast, testicular cancer; lymphomas; neuroblastoma; Hodgkin's, non-Hodgkin's lymphomas; mycosis fungoides; histiocytosis; Kaposi's sarcoma, Langerhans' cell histiocytosis

## CONTRAINDICATIONS

Pregnancy, breastfeeding, infants, hypersensitivity, leukopenia, granulocytopenia, bone marrow suppression, infection

**Precautions:** Renal/hepatic disease, tumor lysis syndrome

**BLACK BOX WARNING:** Extravasation, intrathecal use

## DOSAGE AND ROUTES

**Doses vary greatly**

### Breast cancer

**Adult:** **IV** 4.5 mg/m$^2$ on day 1 of every 21 days in combination with DOXOrubicin and thiotepa

### Hodgkin's disease

**Adult:** **IV** 6 mg/m$^2$ on days 1 and 15 q28 days with DOXOrubicin (ABVD)
**Child:** **IV** 2.5-6 mg/m$^2$/day once q 1-2 wk × 3-6 wks; max weekly dose 12.5 mg/m$^2$

**Available forms:** Inj powder 10 mg for 10 ml **IV** inj; sol for inj 1 mg/ml

### Implementation

**IV inj route**
- Administer **IV** after diluting 10 mg/10 ml NaCl; give through Y-tube or 3-way stopcock or directly over 1 min

**Intermittent IV INF route**
- Further dilute in 50-100 ml of NS, inf over 15-30 min
- Give by intermittent inf
- Sol should be prepared by qualified personnel only under controlled conditions
- Use Luer-Lok tubing to prevent leakage; do not let sol come in contact with skin; if contact occurs, wash well with soap and water

**BLACK BOX WARNING:** Give hyaluronidase 150 units/ml in 1 ml of NaCl, through IV catheter or SUBCUT in circular pattern around extravasated site warm compress for extravasation for vesicant activity treatment

**BLACK BOX WARNING:** Do not administer intrathecally: fatal

**Y-site compatibilities:** Allopurinol, amifostine, aztreonam, bleomycin, CISplatin, cyclophosphamide, DOXOrubicin, droperidol, filgrastim, fludarabine, fluorouracil, granisetron, heparin, leucovorin, melphalan, methotrexate, metoclopramide, mitomycin, ondansetron, PACLitaxel, piperacillin/tazobactam, sargramostim, teniposide, thiotepa, vinCRIStine, vinorelbine

**Y-site incompatibilities:** Furosemide

## ADVERSE EFFECTS

**CNS:** Paresthesias, peripheral neuropathy, depression, headache, seizures, malaise
**CV:** Tachycardia, orthostatic hypotension, hypertension
**GI:** *Nausea, vomiting,* ileus, *anorexia, stomatitis, constipation,* abdominal pain, GI and rectal bleeding, hepatotoxicity, pharyngitis
**GU:** Urinary retention, renal failure, hyperuricemia
**HEMA:** Thrombocytopenia, leukopenia, myelosuppression, agranulocytosis, granulocytosis, aplastic anemia, neutropenia, pancytopenia
**INTEG:** *Rash, alopecia,* photosensitivity, extravasation, tissue necrosis
**META:** SIADH
**SYST:** Tumor lysis syndrome (TLS)
**RESP:** Fibrosis, pulmonary infiltrate, bronchospasm

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete bioavailability |
| **Distribution** | Crosses blood-brain barrier slightly |
| **Metabolism** | Liver—active antineoplastic |
| **Excretion** | Biliary, kidneys |
| **Half-life** | Triphasic <5 min, 50-155 min, 23-85 hr |

### Pharmacodynamics

Unknown

V

## INTERACTIONS

### Individual drugs

Bleomycin: increased synergism
Methotrexate: increased methotrexate action
MitoMYcin: increased bronchospasm
Phenytoin: decreased phenytoin level
Radiation: increased toxicity, bone marrow suppression; do not use together

### Drug classifications

Anticoagulants, antiplatelets, NSAIDs, thrombolytics: increased bleeding risk
Antineoplastics: increased toxicity, bone marrow suppression
CYP3A4 inducers (barbiturates, bosentan, carBAMazepine, efavirenz, phenytoin, nevirapine, rifabutin, rifampin): decreased vinBLAStine effect
CYP3A4 inhibitors (aprepitant, antiretroviral protease inhibitors, clarithromycin, danazol, delavirdine, diltiazem, erythromycin, fluconazole, FLUoxetine, fluvoxaMINE, imatinib, ketoconazole, mibefradil, nefazodone, telithromycin, voriconazole): increased toxicity
Live virus vaccines: increased adverse reactions

### Drug/herb

St. John's wort: avoid use

### Drug/lab test

Increased: uric acid, bilirubin
Decreased: Hgb, platelets, WBC

## NURSING CONSIDERATIONS

### Assessment

- Monitor B/P (baseline and q15min) during administration
- Monitor CBC, differential, platelet count weekly; withhold product if WBC is $<2000/mm^3$ or platelet count is $<75,000/mm^3$; notify prescriber of results; recovery will take 3 wk; RBC, Hct, Hgb may be decreased; nadir occurs on days 4-10, and continues for another 1-2 wk
- **Tumor lysis syndrome:** monitor for hyperkalemia, hyperphosphatemia, hyperuricemia; usually occurs with leukemia, lymphoma; alkalinization of the urine; allopurinol should be used to prevent urate nephropathy; monitor electrolytes and renal function (BUN, uric acid, urine CCR)
- Monitor renal function tests: BUN, serum uric acid, urine CCr before, during therapy; I&O ratio; report fall in urine output of 30 ml/hr; for decreased hyperuricemia
- **Bronchospasm:** can be life threatening; usually occurs when giving mitoMYcin
- Monitor for cold, fever, sore throat (may indicate beginning of infection); notify prescriber if these occur
- Assess for bleeding: hematuria, guaiac, bruising or petechiae, mucosa or orifices q8hr, no rectal temp; avoid IM inj; use pressure to venipuncture sites
- Identify nutritional status: an antiemetic may need to be prescribed
- Assess for gout, joint pain, swelling, increased uric acid; allopurinol or other treatment may be used
- **Assess for symptoms indicating severe allergic reactions:** rash, pruritus, urticaria, itching, flushing, bronchospasm, hypotension; EPINEPHrine and resuscitative equipment should be nearby
- **Hepatitis:** transient hepatitis may occur with continuous IV

### Patient/family education

- Teach patient to avoid use of products containing aspirin or NSAIDs, razors, commercial mouthwash because bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools)
- Instruct patient to report signs of anemia, (fatigue, headache, irritability, faintness, shortness of breath)
- Caution patient to report any changes in breathing or coughing even several mo after treatment; avoid breastfeeding; may cause male infertility
- Advise patient to use sunscreen, wear protective clothing and sunglasses
- Inform patient that hair may be lost during treatment; a wig or hairpiece may make patient feel better; new hair will be different in color, texture
- Advise patient to avoid vaccinations during treatment; serious reactions may occur

**BLACK BOX WARNING:** Teach patient to report irritation, pain, burning, discoloration at IV site extravasation

- Teach patient to report signs/symptoms of infection: fever, chills, sore throat; patient should avoid crowds and persons with known infections
- **Pregnancy:** teach patient to notify prescriber if pregnancy is planned or suspected, not to breastfeed, may cause male infertility. Advise patient that contraception will be necessary during treatment; teratogenesis may occur
- Instruct patient to avoid persons with known infections
- **Infection:** instruct patient to report sore throat, flulike symptoms

### Evaluation

**Positive therapeutic outcome**
- Decreased spread of malignant cells

**⚠ HIGH ALERT**

## vinCRIStine (VCR) (Rx)

(vin-kris′teen)
*Func. class.:* Antineoplastic—miscellaneous
*Chem. class.:* Vinca alkaloid

**Do not confuse:** vinCRIStine/vinBLAStine/vinorelbine

**ACTION:** Inhibits mitotic activity, arrests cell cycle at metaphase; inhibits RNA synthesis, blocks cellular use of glutamic acid needed for purine synthesis; a vesicant

**Therapeutic outcome:** Prevention of rapid growth of malignant cells, immunosuppression

**USES:** Lymphomas, neuroblastomas, Hodgkin's disease, acute lymphoblastic and other leukemias, rhabdomyosarcoma, Wilms' tumor, non-Hodgkin's lymphoma, malignant glioma, soft-tissue sarcoma; **liposomal:** Philadelphia chromosome- negative ALL in second or greater relapse or that has progressed after 2 or more antileukemia therapies

## CONTRAINDICATIONS

Pregnancy, breastfeeding, infants, hypersensitivity, radiation therapy

**BLACK BOX WARNING:** Intrathecal use

**Precautions:** Renal/hepatic disease, hypertension, neuromuscular disease

**BLACK BOX WARNING:** Extravasation

## DOSAGE AND ROUTES

**Adult:** **IV** 0.4-1.4 mg/m$^2$/wk, max 2 mg
**Child >10 kg:** **IV** 1-2 mg/m$^2$/wk, max 2 mg

**Available forms:** Inj 1 mg/ml; liposomal 5 mg/31 ml injection kit

### Implementation
### IV route (vinCRIStine)

**BLACK BOX WARNING:** Do not give intrathecally: fatal

- Administer **IV** after diluting with diluent provided or 1 mg/10 ml of sterile water or 0.9% NaCl; give through Y-tube or 3-way stopcock or directly over 1 min; do not use 5-mg vial for single doses

**BLACK BOX WARNING:** Hyaluronidase 150 units/ml in 1 ml of NaCl; apply warm compress for extravasation

**Y-site compatibilities:** Acyclovir, alemtuzumab, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amiodarone, amphotericin B cholesteryl, amphotericin B lipid complex, amphotericin B liposome, ampicillin, ampicillin–sulbactam, anidulafungin, argatroban, arsenic trioxide, asparaginase, atenolol, atracurium, azithromycin, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium chloride/gluconate, capreomycin, CARBOplatin, carmustine, caspofungin, ceFAZolin, cefoperazone, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, cefTRIAXone, cefuroxime, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, cladribine, clindamycin, codeine, cyclophosphamide, cycloSPORINE, cytarabine, $D_5$W-dextrose 5%, dacarbazine, DACTINomycin, DAPTOmycin, DAUNOrubicin, DAUNOrubicin citrate liposome, dexamethasone, dexmedetomidine, dexrazoxane, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doxacurium, doxapram, DOXOrubicin, DOXOrubicin liposomal, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, ertapenem, erythromycin, esmolol, etoposide, famotidine, fenoldopam, fentaNYL, filgrastim, fluconazole, fludarabine, fluorouracil, foscarnet, fosphenytoin, gallium, ganciclovir, garenoxacin, gatifloxacin, gemcitabine, gentamicin, granisetron, haloperidol, heparin, hydrocortisone sodium phosphate/succinate, HYDROmorphone, hydrOXYzine, ifosfamide, imipenem-cilastatin, inamrinone, insulin, regular, isoproterenol, ketorolac, labetalol, lepirudin, leucovorin, levofloxacin, levorphanol, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, meropenem, mesna, methadone, methohexital, methotrexate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, minocycline, mitoMYcin, mitoXANtrone, mivacurium, morphine, moxifloxacin, nalbuphine, naloxone, nesiritide, niCARdipine, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxaliplatin, PACLitaxel (solvent/surfactant), palonosetron, pamidronate, pancuronium, PEMEtrexed, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phenylephrine, piperacillin, piperacillin–tazobactam, potassium acetate/chloride/phosphates, procainamide, prochlorperazine,

V

promethazine, propranolol, quinupristin-dalfopristin, ranitidine, remifentanil, riTUXimab, rocuronium, sargramostim, sodium acetate/phosphates, succinylcholine, SUFentanil, sulfamethoxazole-trimethoprim, tacrolimus, teniposide, theophylline, thiopental, thiotepa, ticarcillin, ticarcillin–clavulanate, tigecycline, tirofiban, tobramycin, topotecan, trastuzumab, trimethobenzamide, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinorelbine, voriconazole, zidovudine, zoledronic acid

**Y-site incompatibilities:** Amphotericin B conventional colloidal, cefepime, diazepam, gemtuzumab, IDArubicin, lansoprazole, nafcillin, pantoprazole, phenytoin

## ADVERSE EFFECTS

**CNS:** *Decreased reflexes, numbness, weakness, motor difficulties,* CNS depression, cranial nerve paralysis, seizures, peripheral neuropathy
**CV:** Orthostatic hypotension
**EENT:** *Diplopia*
**GI:** *Nausea, vomiting, anorexia, stomatitis, constipation,* paralytic ileus, abdominal pain, hepatotoxicity
**GU:** Renal tubular obstruction
**HEMA:** Thrombocytopenia, leukopenia, myelosuppression, anemia
**INTEG:** *Alopecia,* extravasation
**SYST:** Tumor lysis syndrome (TLS)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Complete bioavailability |
| **Distribution** | Rapidly, widely distributed; crosses blood-brain barrier |
| **Metabolism** | Liver |
| **Excretion** | Biliary, in feces, crosses placenta |
| **Half-life** | Triphasic <5 min, 50-155 min, 23-85 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | 1 wk |

## INTERACTIONS

### Individual drugs

Digoxin: decreased digoxin level
MitoMYcin-C: increased acute pulmonary reactions
Radiation: increased toxicity, bone marrow suppression; do not use together

### Drug classifications

CYP3A4 inducers (barbiturates, bosentan, carBAMazepine, efavirenz, phenytoins, nevirapine, rifabutin, rifampin): decreased vinCRIStine effect
CYP3A4 inhibitors (aprepitant, antiretroviral protease inhibitors, clarithromycin, danazol, delavirdine, diltiazem, erythromycin, fluconazole, FLUoxetine, fluvoxaMINE, imatinib, ketoconazole, mibefradil, nefazodone, telithromycin, voriconazole): increased toxicity
Peripheral nervous system products: increased neurotoxicity
Vaccines/toxoids: decreased immune response

### Drug/herb

St. John's wort: avoid use

### Drug/lab test

Increased: uric acid
Decreased: Hgb, WBC, platelets, sodium

## NURSING CONSIDERATIONS

### Assessment

- Monitor CBC, differential, platelet count weekly; withhold product if WBC is <4000/mm$^3$ or platelet count is <75,000/mm$^3$; notify prescriber of results; platelets may increase or decrease
- Assess neurologic status: paresthesia, weakness, cranial nerve palsies, orthostatic hypotension, lethargy, agitation, psychosis; notify prescriber
- **Bronchospasm:** more common with mitoMYcin
- Identify for increased uric acid levels, joint pain in extremities; increase fluid intake to 2-3 L/day unless contraindicated
- **Tumor lysis syndrome:** hyperkalemia, hyperphosphatemia, hyperuricemia, hypocalcemia; more common in leukemia, lymphoma, use alkalinization of urine with allopurinol, monitor electrolytes, renal function (BUN, urine, CCR, uric acid)

**BLACK BOX WARNING:** Extravasation: Assess for pain, swelling, poor blood return; if extravasation occurs, local injection of hyaluronidase and moderate heat to area may help disperse product

- **Pregnancy/breastfeeding:** Do not use in pregnancy, breastfeeding

### Patient/family education

- Teach patient to avoid use of products containing aspirin or NSAIDs, razors, commercial mouthwash because bleeding may occur; to report symptoms of bleeding (hematuria, tarry stools)
- Instruct patient to report signs of anemia (fatigue, headache, irritability, faintness, shortness of breath)

• Caution patient to report any changes in breathing or coughing, even several mo after treatment
• **Pregnancy:** instruct patient to notify prescriber if pregnancy is planned or suspected; advise patient that contraception will be necessary during and 2 mo after treatment; may be teratogenic, not to breastfeed
• Inform patient that hair may be lost during treatment; a wig or hairpiece may make patient feel better; new hair will be different in color, texture
• Advise patient to avoid vaccinations during treatment; serious reactions may occur
• Teach patient to report signs/symptoms of infection: fever, chills, sore throat; patient should avoid crowds or persons with known infections
• Advise patient to increase fluids, bulk in diet, exercise to prevent constipation
• **Infection:** instruct patient to report sore throat, fever, flulike symptoms; avoid persons with known infection

### Evaluation

**Positive therapeutic outcome**
• Decreased spread of malignancies

**⚠ HIGH ALERT**

## vinorelbine (Rx)

(vi-nor'el-bine)
**Navelbine**
*Func. class.:* Antineoplastic—miscellaneous
*Chem. class.:* Semisynthetic vinca alkaloid

**ACTION:** Inhibits mitotic spindle activity, arrests cell cycle at metaphase; inhibits RNA synthesis, blocks cellular use of glutamic acid needed for purine synthesis; a vesicant

**Therapeutic outcome:** Decreased spread of malignancy

**USES:** Unresectable, advanced non–small-cell lung cancer (NSCLC) stage IV; may be used alone or in combination with cisplatin for stage III or IV NSCLC

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity, infants, granulocyte count <1000 cells/mm$^3$ pretreatment

**Precautions:** Children, geriatric, hepatic/pulmonary/neurologic/renal disease, bone marrow suppression

**BLACK BOX WARNING:** Extravasation severe neutropenia, intrathecal use

## DOSAGE AND ROUTES

**Adult: IV** 30 mg/m$^2$ qwk

**ANC:** 1000-1499/mm$^3$, give 50% dose; <1000 hold dose; <1000/mm$^3$ × 3 wk, discontinue

### Hepatic dose

**Adult:** IV total bilirubin 2.1-3 mg/dl 15 mg/m$^2$ qwk; total bilirubin ≥3 mg/dl 7.5 mg/m$^2$/day

**Available forms:** Inj 10 mg/ml

### Implementation

**BLACK BOX WARNING:** Do not give intrathecally: fatal, syringes with this product should be labeled "Warning: For IV use only, fatal if given intrathecally"

• **Extravasation:** Stop infusion, aspirate, then hyaluronidase 150 units/ml in 1 ml of 0.9% NaCl, thorough IV catheter or SUBCUT in circular pattern around site warm compress for extravasation for vesicant activity treatment
• Antacid before oral agent; give product after evening meal before bedtime

**Intermittent IV infusion route**
• Dilute to 0.5-2 mg/ml with 0.9% NaCl, 0.45% NaCl, $D_5W$, $D_5$/0.45% NaCl, LR, Ringer's; give over 6-10 min into Y-site or central line; flush line

**Continuous IV infusion route**
• Give 40 mg/m$^2$ q3wk after **IV** bol of 8 mg/m$^2$; may be given in combination with DOXOrubicin, fluorouracil, cisplatin

**Y-site compatibilities:** Amikacin, aztreonam, bleomycin, buprenorphine, butorphanol, calcium gluconate, CARBOplatin, cefotaxime, CISplatin, cimetidine, clindamycin, dexamethasone, enalaprilat, etoposide, famotidine, filgrastim, fluconazole, fludarabine, gentamicin, hydrocortisone, LORazepam, meperidine, morphine, netilmicin, ondansetron, plicamycin, streptozocin, teniposide, ticarcillin, tobramycin, vancomycin, vinBLAStine, vinCRIStine, zidovudine

## ADVERSE EFFECTS

**CNS:** Paresthesias, peripheral neuropathy, depression, headache, seizures, weakness, jaw pain, asthenia
**CV:** Chest pain
**GI:** *Nausea, vomiting,* ileus, *anorexia, stomatitis,* constipation, abdominal pain, *diarrhea,* hepatotoxicity, GI obstruction/perforation
**HEMA:** Neutropenia, anemia, thrombocytopenia, granulocytopenia

V

**INTEG:** *Rash, alopecia,* photosensitivity, inj site reaction, necrosis
**META:** Syndrome of inappropriate diuretic hormone
**MS:** Myalgia
**RESP:** Shortness of breath, dyspnea, pulmonary edema, acute bronchospasm, acute respiratory distress syndrome (ARDS)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Poor bioavailability (<50%) |
| **Distribution** | Highly bound to platelets, lymphocytes |
| **Metabolism** | Liver, to metabolite |
| **Excretion** | Bile |
| **Half-life** | 43 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

NSAIDs, anticoagulants: increased bleeding risk
CYP3A4 inhibitors (antiretroviral protease inhibitors, aprepitant, clarithromycin, danazol, delavirdine, diltiazem, erythromycin, fluconazole, FLUoxetine, fluvoxaMINE, imatinib, ketoconazole, mibefradil, nefazodone, telithromycin, voriconazole): increased toxicity
CYP3A4 inducers (barbiturates, bosentan, carBAMazepine, efavirenz, phenytoins, nevirapine, rifabutin, rifampin): decreased vinorelbine effect

### Drug/herb

St. John's wort: avoid use

### Drug/lab test

Increased: LFTs, bilirubin
Decreased: Hgb, WBC, platelets

## NURSING CONSIDERATIONS

### Assessment

- Monitor B/P (baseline and q15min) during administration

**BLACK BOX WARNING: Bone marrow suppression:** Monitor CBC, differential, platelet count before each dose; withhold product if WBC is <4000/mm$^3$ or platelet count is <75,000/mm$^3$; notify prescriber of results; recovery will take 3 wk; liver function tests: AST, ALT, bilirubin, LDH

- **Bronchospasm:** more common with mitoMYcin; also dyspnea, wheezing; may be treated with oxygen, bronchodilators, corticosteroids, especially if there is underlying pulmonary disease
- **Neurological status:** Paresthesia, peripheral neuropathy, weakness, these may occur even after termination of treatment
- Monitor renal function tests: BUN, serum uric acid, urine CCr before, during therapy, I&O ratio; report fall in urine output of 30 ml/hr; for decreased hyperuricemia
- Monitor for cold, fever, sore throat (may indicate beginning **infection**); notify prescriber if these occur; effects of alopecia on body image
- **Assess for bleeding:** hematuria, guaiac, bruising or petechiae, mucosa or orifices q8hr: no rectal temp; avoid IM inj; use pressure on venipuncture sites
- **Assess for symptoms indicating severe allergic reactions:** rash, pruritus, urticaria, itching, flushing, bronchospasm, hypotension; EPINEPHrine and resuscitative equipment should be nearby
- Assess neurologic status: numbness, pain, tingling, loss of Achilles reflex, weakness, palsies

### Patient/family education

- Teach patient to use liquid diet: cola, gelatin; dry toast or crackers may be added if patient is not nauseated or vomiting
- Advise patient to rinse mouth 3-4 ×/day with water and brush teeth 2-3 ×/day with soft brush or cotton-tipped applicators for stomatitis; use unwaxed dental floss
- Advise patient to avoid crowds, people with infections, vaccinations
- **Pregnancy:** notify prescriber if pregnancy is planned or suspected; advise patient to use effective contraception during and for ≥2 mo after product is discontinued; do not use in pregnancy, breastfeeding
- Teach patient hair may be lost but will grow back; new hair may be different texture, color
- **Infection:** report sore throat, fever, flulike symptoms

### Evaluation

**Positive therapeutic outcome**

- Decreased spread of malignant cells

**⚠ HIGH ALERT**

## vismodegib

(vis'moe-deg'ib)
**Erivedge**
*Func. class.:* Antineoplastic biologic response modifier
*Chem. class.:* Signal transduction inhibitor (STI)

**ACTION:** A hedgehog (Hh) signaling pathway inhibitor

**Therapeutic outcome:** Decreased spread of tumor

**USES:** Patients who have metastatic basal cell carcinoma, locally advanced, that has recurred after surgery and who are not candidates for surgery/radiation

## CONTRAINDICATIONS

Hypersensitivity, breastfeeding

**BLACK BOX WARNING:** Intrauterine fetal death, male-mediated teratogenicity, pregnancy

**Precautions:** Children, blood donation

## DOSAGE AND ROUTES

**Adult: PO** 150 mg/day

**Available forms:** Cap 150 mg

### Implementation

- Give without regard to food
- To be swallowed whole, do not open or crush caps
- If a dose is missed, do not take additional dose, take at usual time
- Store at 77°F (25°C)

## ADVERSE EFFECTS

**GI:** *Nausea, vomiting, dysgeusia, constipation, anorexia, diarrhea*
**GU:** Amenorrhea, azotemia
**INTEG:** *Alopecia*
**META:** Hyponatremia
**MISC:** *Fatigue, decreased weight*
**MS:** *Arthralgia*

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding >99% |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Elimination 4 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Effect of each vismodegib, osimertinib, sofosbuvir
Increase: Effect of velpatasvir, topotecan
Increase: INR levels warfarin, increase INR monitoring

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING: Pregnancy:** Verify pregnancy status of all women within 7 days before starting therapy; effective contraception is needed during and for 7 mo after treatment; men receiving this product should use condoms with spermicide (even after vasectomy) during sexual intercourse with female partners and for 2 mo after the last dose; report exposure during pregnancy to the Genentech Adverse Event Line at 888-835-2555

### Patient/family education

**BLACK BOX WARNING:** Pregnancy: Teach patient to notify their provider immediately if pregnancy is suspected (or in a female partner for male patients); effective contraception is needed during and for 7 mo after treatment; men receiving this product should use condoms with spermicide (even after vasectomy) during sexual intercourse with female partners and for 2 mo after the last dose; if product is used during pregnancy or if the patient becomes pregnant during use, the woman (or female partner for male patients) should be apprised of the potential hazard to the fetus; encourage exposed women (either directly or through seminal fluid) to participate in the ERIVEDGE pregnancy pharmacovigilance program

- Teach patient about reason for treatment, expected results
- Teach patient if dose is missed, do not take, but resume scheduled doses; swallow whole, do not crush or chew
- Tell patient not to donate blood during therapy or for ≥7 months after conclusion of product
- Amenorrhea: It is unknown if reversible after completion of treatment

### Evaluation

**Positive therapeutic outcome**

- Decreased spread of tumor

## vitamin A (PO, OTC; IM, Rx)

**Aquasol A, Del-Vi-A, Vitamin A**

*Func. class.:* Vitamin, fat-soluble
*Chem. class.:* Retinol

**ACTION:** Needed for normal bone and tooth development, visual dark adaptation, skin disease, mucosa tissue repair; assists in production of adrenal steroids, cholesterol, RNA

V

**Therapeutic outcome:** Prevention, absence of vit A deficiency

## USES: Vit A deficiency

## CONTRAINDICATIONS

Pregnancy (parenteral), hypersensitivity to vit A, malabsorption syndrome (PO), hypervitaminosis A, parenteral, **IV** administration

**Precautions:** Pregnancy (PO), breastfeeding, impaired renal function, children, hepatic disease, infants, alcoholism, hepatitis

## DOSAGE AND ROUTES

**Adult and child >8 yr:** PO 100,000-500,000 international units/day × 3 days, then 50,000 international units/day × 2 wk; dose based on severity of deficiency; maintenance 10,000-20,000 international units for 2 mo

**Child 1-8 yr:** IM 5000-15,000 international units/day × 10 days

**Infant <1 yr:** IM 5000-15,000 international units × 10 days

### Maintenance

**Child 4-8 yr:** IM 15,000 international units/day × 2 mo

**Child <4 yr:** IM 10,000 international units/ day × 2 mo

**Available forms:** Caps 10,000, 25,000, 50,000 international units; drops 5000 international units; inj 50,000 international units/ml; tabs 10,000, 25,000, 50,000 international units

### Implementation

**PO route**

- Give with food (PO) for better absorption; do not give **IV** because anaphylaxis may occur, IM only
- Oral preparations are not indicated for vit A deficiency in those with malabsorption syndrome
- Store in airtight, light-resistant container

**IM route**

- Give deep in large muscle mass; do not use deltoid muscle for administration of >1 ml

## ADVERSE EFFECTS

**CNS:** Headache, increased ICP, intracranial hypertension, lethargy, malaise

**EENT:** Gingivitis, papilledema, exophthalmos, inflammation of tongue and lips

**GI:** Nausea, vomiting, anorexia, abdominal pain, *jaundice*

**INTEG:** Drying of skin, pruritus, increased pigmentation, night sweats, alopecia

**META:** Hypomenorrhea, hypercalcemia

**MS:** Arthralgia, retarded growth, hard areas on bone

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Stored in liver, kidneys, lungs |
| **Metabolism** | Liver |
| **Excretion** | Breast milk |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Cholestyramine, colestipol, mineral oil: decreased absorption of vit A

### Drug classifications

Contraceptives (oral), corticosteroids: increased levels of vit A

### Drug/lab test

False increase: bilirubin, serum cholesterol

## NURSING CONSIDERATIONS

### Assessment

- Assess nutritional status: increase intake of yellow and dark green vegetables, yellow/orange fruits, vit A–fortified foods, liver, egg yolks
- Assess vit A deficiency: decreased growth; night blindness; dry, brittle nails; hair loss; urinary stones; increased infection; hyperkeratosis of skin; drying of cornea
- Identify vit A deficiency by plasma vit A, carotene level
- Assess for chronic vit A toxicity: increased calcium, BUN, glucose, cholesterol, triglyceride level
- **Pregnancy/breastfeeding:** Do not use IM in pregnancy, fetal complications may occur, breastfeeding is considered safe at recommended dietary levels

### Patient/family education

- Instruct patient that if dose is missed, it should be omitted
- Inform patient that ophth exams may be required periodically throughout therapy
- Instruct patient not to use mineral oil while taking this product because absorption will be decreased
- Advise patient to notify prescriber of nausea, vomiting, lip cracking, loss of hair, headache
- Caution patient not to take more than the prescribed amount

### Evaluation

**Positive therapeutic outcome**

- Increase in growth rate, weight
- Absence of dry skin and mucous membranes, night blindness

## TREATMENT OF OVERDOSE:
Discontinue product

### vitamin A acid
*See tretinoin*

### vitamin $B_1$
*See thiamine*

### vitamin $B_{12}$ (cyanocobalamin) (PO, OTC; IM/SUBCUT, Rx)
(sye-an-oh-koe-bal'a-min)
**Alphamin, Anacobin** 🍁**, Bedoz** 🍁**, Cobex, Cobolin-M Crystamine, Crysti-1000, Cyanabin** 🍁**, Cyanoject, Cyomin, Ener-B, Hydrobexan, Hydro Cobex, Hydro-Crysti-12**
*Func. class.:* Vitamin $B_{12}$, water-soluble vitamin

### vitamin $B_{12}$a (hydroxocobalamin) (vit $B_{12}$) (Rx)
(hye-drox'o-ko-bal'a-min)
**Hydro Cobex, Hydroxycobal, LA-12, Nascobal, Neuroforter, Rubesol-1000, Rubramin PC, Shovite, Vibral LA, Vibral, Vitamin $B_{12}$**

**ACTION:** Needed for adequate nerve functioning, protein and carbohydrate metabolism, normal growth, RBC development and cell reproduction

**Therapeutic outcome:** Prevention, correction of vit $B_{12}$ deficiency

**USES:** Vit $B_{12}$ deficiency; pernicious anemia; vit $B_{12}$ malabsorption syndrome; Schilling test; increased requirements with pregnancy, thyrotoxicosis, hemolytic anemia, hemorrhage, renal and hepatic disease

## CONTRAINDICATIONS
Hypersensitivity, optic nerve atrophy

**Precautions:** Pregnancy, breastfeeding, children

## DOSAGE AND ROUTES
### Cyanocobalamin
**Adult:** PO up to 1000 mcg/day; SUBCUT/IM 30-100 mcg/day × 1 wk, then 100-200 mcg/mo

### Shilling test
**Adult and child:** IM 1000 mcg in 1 dose
**Child:** PO up to 1000 mcg/day; SUBCUT/IM 30-50 mcg/day × 2 wk, then 100 mcg/mo; NASAL 500 mcg qwk

### Hydroxocobalamin
**Adult:** SUBCUT/IM 30-50 mcg/day × 5-10 days, then 100-200 mcg/mo
**Child:** SUBCUT/IM 30-50 mcg/day × 5-10 days, then 30-50 mcg/mo

**Available forms:** Cyanocobalamin: tabs 25, 50, 100, 250, 500, 1000, 5000 mcg; ext rel tabs 100, 200, 500, 1000 mcg; lozenges: 100, 250, 500 mcg; nasal gel 500 mcg/spray; inj 100, 1000 mcg/ml; hydroxocobalamin: inj 1000 mcg/ml

### Implementation
**PO route**
- Give with fruit juice to disguise taste; administer immediately after mixing
- Give with meals if possible for better absorption; large doses should not be used because most is excreted

**IM route**
- Give by IM inj for pernicious anemia for life unless contraindicated

**IV route**
- May be mixed with TPN sol, but **IV** route is not recommended

**Y-site compatibilities:** Heparin, hydrocortisone sodium succinate, potassium chloride

**Solution compatibilities:** Dextrose/Ringer's or LR's combinations, dextrose/saline combinations, $D_5W$, $D_{10}W$, 0.45% NaCl, Ringer's or LR's sol, ascorbic acid

## ADVERSE EFFECTS
**CNS:** Flushing, optic nerve atrophy
**CV:** HF, peripheral vascular thrombosis, pulmonary edema
**GI:** *Diarrhea*
**INTEG:** Itching, rash, pain at inj site
**META:** Hypokalemia
**SYST:** Anaphylactic shock

### Pharmacokinetics
| | |
|---|---|
| **Absorption** | Well absorbed (IM, SUBCUT) |
| **Distribution** | Crosses placenta |
| **Metabolism** | Stored in liver, kidney, stomach |
| **Excretion** | 50%-90% (urine), breast milk |
| **Half-life** | Unknown |

### Pharmacodynamics
Unknown

## INTERACTIONS
### Individual drugs
Aminosalicylic acid, chloramphenicol, cimetidine, colchicine: decreased absorption
PrediniSONE: increased absorption

V

### Drug classifications
Aminoglycosides, anticonvulsants, potassium products: decreased absorption

### Drug/herb
Goldenseal: decreased vit $B_{12}$ absorption

### Drug/lab test
False positive: intrinsic factor

## NURSING CONSIDERATIONS
### Assessment
- Assess for deficiency: anorexia, dyspepsia on exertion, palpitations, paresthesias, psychosis, visual disturbances, pallor, red inflamed tongue, neuropathy, edema of legs
- Monitor potassium levels during beginning treatment in patients with megaloblastic anemia
- Monitor CBC for increase in reticulocyte count during 1st wk of therapy, then increase in RBC and hemoglobin; folic acid levels, vit $B_{12}$ levels
- Assess nutritional status: egg yolks, fish, organ meats, dairy products, clams, oysters, which are good sources of vit $B_{12}$
- Monitor for pulmonary edema or worsening of HF in cardiac patients

### Patient/family education
- Instruct patient that treatment must continue for life if diagnosed as having pernicious anemia
- Advise patient to eat well-balanced diet from the food pyramid and comply with dietary recommendation
- Caution patient not to exceed the RDA of vit $B_{12}$ because adverse reactions may occur

### Evaluation
**Positive therapeutic outcome**
- Decreased anorexia, dyspnea on exertion, palpitations, paresthesias, psychosis, visual disturbances, edema of legs
- Prevention or correction of vit $B_{12}$ deficiency

## TREATMENT OF OVERDOSE:
Discontinue products

## vitamin C (ascorbic acid) (OTC, Rx)
(as-kor'bic)
**Acerca C, Apo-C, Ascor L-500, Cenolate, Equaline Vitamin C, Walgreens Gold Seal, and many more**
*Func. class.:* Vitamin C, water-soluble vitamin

**ACTION:** Needed for wound healing, collagen synthesis, antioxidant, carbohydrate metabolism

**Therapeutic outcome:** Replacement and supplementation of vit C

**USES:** Vit C deficiency, scurvy, delayed wound and bone healing, chronic disease, before gastrectomy, dietary supplement

**Unlabeled uses:** Common cold prevention

## CONTRAINDICATIONS
Tartrazine, sulfite sensitivity; G6PD deficiency

**Precautions:** Pregnancy, gout, diabetes, renal calculi (large doses)

## DOSAGE AND ROUTES
### RDA
**Neonate and up to 6 mo:** PO 30 mg/day
**Infant:** PO 40-50 mg/day
**Child 1-3 yr:** PO 15 mg/day
**Child 4-8 yr:** PO 25 mg/day
**Child 9-13 yr:** PO 45 mg/day
**Child 14-18 yr:** PO 65 mg/day (females), 75 mg/day (males)
**Adult:** PO 50-500 mg/day

### Scurvy
**Adult:** PO/SUBCUT/IM/**IV** 100 mg-250 mg daily × 2 wk, then 50 mg or more daily
**Child:** PO/SUBCUT/IM/**IV** 100-300 mg daily × 2 wk, then 35 mg or more daily

### Wound healing/chronic disease/fracture
May be given with zinc
**Adult:** SUBCUT/IM/**IV**/PO 200-500 mg daily for 1-2 mo
**Child:** SUBCUT/IM/**IV**/PO 100-200 mg added doses for 1-2 mo

### Urine acidification
**Adult:** 4-12 g daily in divided doses
**Child:** 500 mg q6-8hr

**Available forms:** Tabs 25, 50, 100, 250, 500, 1000, 1500 mg; effervescent tabs 1000 mg; chewable tabs 100, 250, 500 mg; time-release tabs 500, 750, 1000, 1500 mg; time-release caps 500 mg; crystals 4 g/tsp; powder 4 g/tsp; liquid 35 mg/0.6 ml; sol 100 mg/ml; syr 20 mg/ml, 500 mg/5 ml; inj SUBCUT, IM, **IV** 100, 250, 500 mg/ml

### Implementation
**PO route**
- Swallow time rel tabs or caps whole; do not break, crush, or chew
- Mix oral sol with foods or fluids

**IM route**
- Not to be diluted; give deep in large muscle mass

**IV, direct route**
- Give undiluted by *direct* **IV** 100 mg over at least 1 min, rapid inf may cause fainting

**Intermittent IV infusion route**
• Give by intermittent inf after diluting with $D_5W$, $D_{10}W$, 0.9% NaCl, 0.45% NaCl, LR, Ringer's sol, dextrose/saline, dextrose/Ringer's combinations; temp will increase pressure in ampules; wrap with gauze before breaking

**Syringe compatibilities:** Metoclopramide, aminophylline, theophylline

**Syringe incompatibilities:** CeFAZolin, doxapram

**Y-site compatibilities:** Warfarin

## ADVERSE EFFECTS

**CNS:** Headache, insomnia, dizziness, fatigue, flushing
**GI:** Nausea, vomiting, diarrhea, anorexia, heartburn, cramps
**GU:** Polyuria, urine acidification, oxalate or urate renal stones, dysuria
**HEMA:** Hemolytic anemia in patients with G6PD
**INTEG:** Inflammation at inj site

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Readily absorbed (PO) |
| **Distribution** | Widely distributed; crosses placenta |
| **Metabolism** | Oxidation |
| **Excretion** | Kidneys, inactive; breast milk |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Drug/lab test

False positive: negative in glucose tests (Clinitest, Tes-Tape)
False negative: occult blood (large dose), urine bilirubin, leukocyte determination

## NURSING CONSIDERATIONS

### Assessment

• Assess nutritional status for inclusion of foods high in vit C: citrus fruits, cantaloupe, tomatoes
• Assess for vit C deficiency before, during, and after treatment; scurvy (gingivitis, bleeding gums, loose teeth); poor bone development
• Monitor I&O ratio, polyuria; in patients receiving large doses, renal stones may occur; urine pH (acidification)
• Monitor ascorbic acid levels throughout treatment if continued deficiency is suspected
• Assess inj sites for inflammation, pain, redness, thrombophlebitis if in large doses
• **Pregnancy/breastfeeding:** Use only recommended dietary allowances in pregnancy, breastfeeding

### Patient/family education

• Teach patient necessary foods to be included in diet that are rich in vit C: citrus fruits, cantaloupe, tomatoes, chili peppers (red)
• Teach patient that smoking decreases vit C levels; not to exceed prescribed dose; increases will be excreted in urine, except time release
• Teach patient not to exceed RDA recommended dose, urinary stones may occur
• Teach patient using ascorbic acid for acidification of urine to test urine pH periodically

### Evaluation

**Positive therapeutic outcome**
• Absence of anorexia, irritability, pallor, joint pain, hyperkeratosis, petechiae, poor wound healing
• Reversal of scurvy: bleeding gums, gingivitis, loose teeth

## vitamin D (cholecalciferol, vitamin $D_3$ or ergocalciferol, vitamin $D_2$) (Rx, OTC)

**Calciferol, Delta-D, Drisdol, Radiostol, Radiostol Forte, vitamin D, vitamin $D_3$**
*Func. class.:* Vitamin D
*Chem. class.:* Fat-soluble vitamin

**Do not confuse:** Calciferol/calcitriol

**ACTION:** Needed for regulation of calcium, phosphate levels; normal bone development; parathyroid activity; neuromuscular functioning

**Therapeutic outcome:** Prevention of rickets, osteomalacia, normal calcium/phosphate levels

**USES:** Vit D deficiency, rickets, renal osteodystrophy, hypoparathyroidism, hypophosphatemia, psoriasis, rheumatoid arthritis

## CONTRAINDICATIONS

Hypersensitivity, hypercalcemia, renal dysfunction, hyperphosphatemia

**Precautions:** Pregnancy, CV disease, renal calculi

## DOSAGE AND ROUTES

### Deficiency

**Adult:** PO/IM 12,000 international units/day, then increased to 500,000 international units/day
**Child:** PO/IM 1500-5000 international units/day × 2-4 wk, may repeat after 2 wk or 600,000 international units as single dose

### Hypoparathyroidism

**Adult and child:** PO/IM 200,000 international units given with 4 g calcium tab

V

**Available forms:** Tabs 400, 1000, 50,000 international units; caps 25,000, 50,000 international units; oral sol 8000 international units/ml; inj 500,000 international units/ml, 500,000 international units/5 ml

### Implementation

**PO route**

- PO may be increased q4wk depending on blood level
- Store in airtight, light-resistant container at room temperature

**IM route**

- Give inj deeply in large muscle mass, administer slowly, aspirate to avoid **IV** administration, rotate inj site

## ADVERSE EFFECTS

**CNS:** Fatigue, weakness, drowsiness, seizures, headache, psychosis
**CV:** Hypertension, dysrhythmias
**GI:** Nausea, vomiting, anorexia, cramps, diarrhea, constipation, metallic taste, dry mouth
**GU:** Polyuria, nocturia, hematuria, albuminuria, renal failure, decreased libido
**INTEG:** Pruritus, photophobia
**MS:** Decreased bone growth, early joint pain, early muscle pain

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed |
| **Distribution** | Stored in liver |
| **Metabolism** | Liver, sun |
| **Excretion** | Bile, kidney |
| **Half-life** | 12-22 hr |

### Pharmacodynamics

| | PO | IM |
|---|---|---|
| **Onset** | Unknown | Unknown |
| **Peak** | 4 hr | Unknown |
| **Duration** | 15-20 days | Unknown |

## INTERACTIONS

### Individual drugs

Cholestyramine, colestipol, PHENobarbital, phenytoin: decreased effects of vit D
Verapamil: increased toxicity

### Drug classifications

Antacids, diuretics (thiazide): increased toxicity

## NURSING CONSIDERATIONS

### Assessment

- Monitor BUN, urinary calcium, AST, ALT, cholesterol, creatinine, uric acid, chloride, magnesium, electrolytes, urine pH, phosphate—may increase; calcium should be kept at 9-10 mg/dl; vit D at 50-135 international units/dl, phosphate at 70 mg/dl; alkaline phosphatase may be decreased
- Monitor for increased blood level; toxic reactions may occur rapidly
- Assess for dry mouth, metallic taste, polyuria, bone pain, muscle weakness, headache, fatigue, tinnitus, change in LOC, irregular pulse, dysrhythmias, increased respirations, anorexia, nausea, vomiting, cramps, diarrhea, constipation; may indicate hypercalcemia
- Assess renal status: decreased urinary output (oliguria, anuria), edema in extremities, weight gain ≥5 lb, periorbital edema
- Assess nutritional status, diet for sources of vit D (milk, cod, halibut, salmon, sardines, egg yolk), calcium (dairy products, dark green vegetables), phosphates (dairy products)
- **Pregnancy/breastfeeding:** Use only recommended dietary allowances in pregnancy, breastfeeding

### Patient/family education

- Advise patient to omit dose if missed; to avoid vitamin supplements unless directed by prescriber
- Inform patient of necessary foods to be included in diet
- Advise patient to keep appointments for evaluation because therapeutic and toxic levels are narrow
- Instruct patient to report weakness, lethargy, headache, anorexia, loss of weight; to report nausea, vomiting, abdominal cramps, diarrhea, constipation, excessive thirst, polyuria, muscle and bone pain
- Caution patient to decrease intake of antacids and laxatives containing magnesium

### Evaluation

**Positive therapeutic outcome**

- Calcium levels 9-10 ml/dl
- Decreasing symptoms of bone disease

## vitamin E (OTC)

**Aquasol E**

*Func. class.:* Vitamin E
*Chem. class.:* Fat-soluble vitamin

**ACTION:** Needed for digestion and metabolism of polyunsaturated fats, decreases platelet aggregation, decreases blood clot formation, promotes normal growth and development of muscle tissue, prostaglandin synthesis

**Therapeutic outcome:** Prevention and treatment of vit E deficiency

**USES:** Vit E deficiency, impaired fat absorption, hemolytic anemia in premature neonates, prevention of retrolental fibroplasia, sickle cell anemia, supplement in malabsorption syndrome

## CONTRAINDICATIONS

**IV** use in infants

**Precautions:** Pregnancy, anemia, breastfeeding, hypothrombinemia

## DOSAGE AND ROUTES

### Deficiency

**Adult:** PO 60-75 international units/day
**Child:** PO 1 international unit/kg (malabsorption)

### Prevention of deficiency

**Adult:** PO 30 international units/day
**Infant:** PO 5 international units/day

### Topical route

**Adult and child:** TOP apply to affected areas as needed

**Available forms:** Caps 100, 200, 400, 500, 600, 1000 international units; tabs 100, 200, 400 international units; drops 15 mg/0.3 ml; chew tabs 400 units; ointment, cream, lotion, oil

### Implementation

**PO route**

- Chew chewable tabs well
- Sol may be dropped in mouth or mixed with food
- Store in airtight, light-resistant container

**Topical route**

- Apply topical to moisturize dry skin

## ADVERSE EFFECTS

**CNS:** Headache, fatigue
**CV:** Increased risk of thrombophlebitis
**EENT:** Blurred vision
**GI:** Nausea, cramps, diarrhea
**GU:** Gonadal dysfunction
**INTEG:** Sterile abscess, contact dermatitis
**META:** Altered metabolism of hormones (thyroid, pituitary, adrenal), altered immunity
**MS:** Weakness

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 20%-80% (PO) |
| **Distribution** | Widely distributed, stored in fat |
| **Metabolism** | Liver |
| **Excretion** | Bile |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Cholestyramine, colestipol, mineral oil, sucralfate: decreased absorption

### Drug classification

Anticoagulants (oral): increased action of anticoagulants

## NURSING CONSIDERATIONS

### Assessment

- Assess nutritional status: intake of wheat germ, dark green leafy vegetables, nuts, eggs, liver, vegetable oils, dairy products, cereals
- Assess for vit E deficiency (usually in neonates): irritability, restlessness, hemolytic anemia
- **Pregnancy/breastfeeding:** Use only recommended dietary allowances in pregnancy, breastfeeding

### Patient/family education

- Inform patient necessary foods to be included in diet high in vit E
- Instruct patient to omit if dose is missed
- Instruct patient to avoid vit supplements unless directed by prescriber because overdose may occur

### Evaluation

**Positive therapeutic outcome**

- Absence of hemolytic anemia
- Adequate vit E levels
- Improvement in skin lesions
- Decrease in edema

**⚠ HIGH ALERT**

# vorapaxar

(vor′a-pax′ar)
**Zontivity**
*Func. class.:* Platelet inhibitor

**ACTION:** Antagonizes the protease-activated receptor-1 (PAR-1) expressed on platelets

**Therapeutic outcome:** Absence of MI, stroke

**USES:** Secondary myocardial infarction prophylaxis or stroke prophylaxis or thrombosis prophylaxis for reduction of thrombotic cardiovascular events in patients with a history of myocardial infarction or with peripheral arterial disease

## CONTRAINDICATIONS

**BLACK BOX WARNING:** Bleeding, intracranial bleeding, stroke

**Precautions:** Breastfeeding, coronary artery bypass graft surgery (CABG), geriatric patients, hepatic disease, labor, obstetric delivery, pregnancy, renal impairment, surgery

## DOSAGE AND ROUTES

**Adult: PO** 2.08 mg once daily with aspirin and/or clopidogrel

V

**Available forms:** Tab 2.08 mg

### Implementation
- May be administered without regard to food

## ADVERSE EFFECTS
**CNS:** Depression *intracranial bleeding*
**EENT:** retinal changes
**HEMA:** Anemia, bleeding
**INTEG:** Rash
**MISC:** Rash

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Within 1 week of treatment reaches ≥80% inhibition of thrombin receptor; protein binding 99% |
| **Metabolism** | Unknown |
| **Excretion** | Primarily feces |
| **Half-life** | 3-4 days, terminal approximately 8 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1 hr |
| **Duration** | Unknown |

## INTERACTIONS
### Drug classifications
**Beers Criteria**
Increase: Vorapaxar effect: CYP3A4 inhibitors (clarithromycin, indinavir, itraconazole, ketoconazole, nefazodone, nelfinavir, posaconazole, saquinavir, telaprevir

### Drug/herb
Decrease: Vorapaxar level, St. John's wort, avoid using concurrent (carBAMazepine, phenytoin, rifAMPin)
CYP3A inducers: decreased vorapaxar effect
Other platelet inhibitors, anticoagulants, calcium channel blockers, CYP3A inhibitors, estradiols, NSAIDs, rifampins, salicylates, SNRIs, SSRIs, thrombolytics: increased bleeding risk

## NURSING CONSIDERATIONS
### Assessment
**BLACK BOX WARNING:** Assess for bleeding, including intracranial bleeding and stroke during treatment. Bleeding should be suspected in any patient presenting with hypotension who has recently undergone surgery, coronary angiography, percutaneous coronary intervention (PCI), or CABG. Avoid products that increase bleeding risk (salicylates, NSAIDs, SSRIs, SNRIs), avoid use in liver failure

- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed, excretion unknown
- Teach patient to inform all providers that this product is being used, not to use OTC, Rx, or herbs without approval of prescriber
- Teach patient not to breastfeed, report if pregnancy is planned or suspected
- Advise patient to take as prescribed with aspirin or clopidogrel, not to use alone, not to discontinue without prescriber approval

### Patient/family education
- Advise patient to report any unusual bruising, bleeding to prescriber; that it may take longer to stop bleeding
- Teach patient to take without regard to food

### Evaluation
**Positive therapeutic outcome**
- Absence of MI, stroke

**⚠ HIGH ALERT**

## voriconazole (Rx)
(vohr-i-kahn'a-zol)
**Vfend**
*Func. class.:* Antifungal

**Do not confuse:** Vfend/Venofer

**ACTION:** Inhibits fungal CYP 450-mediation demethylation, needed for biosynthesis, causing leakage from cell membrane

**Therapeutic outcome:** Decreasing signs, symptoms of infection

**USES:** Invasive aspergillosis, serious fungal infections (*Candida* sp., *Scedosporium apiospermum, Fusarium* sp.), *Monosporium, apiospermum*

## CONTRAINDICATIONS
Pregnancy, breastfeeding, children, hypersensitivity, severe bone marrow depression, severe hepatic disease

**Precautions:** Renal disease (**IV**); Asian/African descent, cardiomyopathy, cholestasis, chemotherapy, lactase deficiency, visual disturbances, renal failure, pancreatitis, QT prolongation, hypokalemia, ventricular dysrhythmias, torsades de pointes

## DOSAGE AND ROUTES
### Esophageal candidiasis
**Adult/geriatric/child ≥12 yr:** PO IV **≥40 kg** 200 mg q12hr; **<40 kg** 100 mg q12hr

### Candidemia of the skin, kidney, bladder wall, abdomen (non-neutropenic patients)

**Adult/child ≥12 yr:** **IV** loading dose 6 mg/kg q12hr × 24 hr, then 3-4 mg/kg q12hr × ≥14 days and ≥7 days after resolution of symptoms; PO after loading dose **>40 kg** 200 mg q12hr × ≥14 days and ≥7 days after resolution of symptoms; **<40 kg** 100 mg q12hr × ≥14 days and ≥7 days after resolution of symptoms

### Invasive aspergillosis

**Adult/adolescent:** **IV** 6 mg/kg q12hr (loading dose) then 4 mg/kg q12hr, may reduce to 3 mg/kg q12hr if intolerable

**Child ≥12 yr:** **IV** 6 mg/kg q12hr, then 4 mg/kg q12hr

### Renal dose

**Adult:** PO CCr <50 ml/min, use only orally

### Hepatic dose

**Adult:** PO/IV (Child-Pugh Class A or B): Standard loading dose, then 50% of maintenance dose; (Child-Pugh Class C): Avoid use

**Available forms:** Tabs 50, 200 mg; powder for inj, lyophilized 200 mg, powder for oral susp 45 g (40 mg/ml after reconstitution)

### Implementation

- Give 1 hr before or after meals
- Store at room temperature (powder, tabs)

**Intermittent IV infusion route**

- Give product only after C&S confirms organism, and product needed to treat condition; make sure product only is used in life-threatening infections
- Reconstitute powder with 19 ml water for inj to 10 mg/ml, shake until dissolved; infuse over 1-2 hr at a conc of 5 mg/ml or less; do not admix with other products, 4.2% sodium bicarbonate inf

**Y-site compatibilities:** Acyclovir, alfentanil, allopurinol, amifostine, amikacin, aminocaproic acid, aminophylline, amiodarone, amphotericin B liposome, ampicillin, ampicillin/sulbactam, anidulafungin, azithromycin, aztreonam, bivalirudin, bleomycin, bumetanide, buprenorphine, butorphanol, calcium acetate/chloride/gluconate, CARBOplatin, carmustine, caspofungin, ceFAZolin, cefotaxime, cefoTEtan, cefOXitin, cefTAZidime, ceftizoxime, ceftRIAXone, chloramphenicol, chlorproMAZINE, cimetidine, ciprofloxacin, cisatracurium, CISplatin, clindamycin, cyclophosphamide, cytarabine, dacarbazine, DACTINomycin, DAPTOmycin, DAUNOrubicin, dexamethasone, dexmedetomidine, dexrazoxane, digoxin, diltiazem, diphenhydrAMINE, DOBUTamine, DOCEtaxel, dolasetron, DOPamine, doripenem, doxacurium, doxycycline, droperidol, enalaprilat, ePHEDrine, EPINEPHrine, epirubicin, ertapenem, erythromycin, esmolol, etoposide, etoposide phosphate, famotidine, fenoldopam, fentaNYL, fluconazole, fludarabine, fluorouracil, foscarnet, fosphenytoin, furosemide, ganciclovir, gemcitabine, gentamicin, glycopyrrolate, granisetron, haloperidol, heparin, hydrALAZINE, hydrocortisone, ifosfamide, imipenem/cilastatin, inamrinone, insulin, irinotecan, isoproterenol, ketorolac, labetalol, leucovorin, levofloxacin, lidocaine, linezolid, LORazepam, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, meropenem, mesna, metaraminol, methohexital, methotrexate, methyldopate, methylPREDNISolone, metoclopramide, metoprolol, metroNIDAZOLE, midazolam, milrinone, mitoMYcin, morphine, nafcillin, nalbuphine, naloxone, niCARdipine, nitroglycerin, norepinephrine, octreotide, ondansetron, oxaliplatin, oxytocin, PACLitaxel, palonosetron, pancuronium, pentamidine, pentazocine, PENTobarbital, PHENobarbital, phentolamine, phenylephrine, piperacillin/tazobactam, potassium chloride/phosphates, procainamide, promethazine, propranolol, quinupristin/dalfopristin, remifentanil, rocuronium, sodium acetate/bicarbonate/phosphates, streptozocin, succinylcholine, SUFentanil, tacrolimus, teniposide, theophylline, thiotepa, ticarcillin/clavulanate, tirofiban, tobramycin, topotecan, trimethobenzamide, trimethoprim/sulfamethoxazole, vancomycin, vasopressin, vecuronium, verapamil, vinBLAStine, vinCRIStine, vinorelbine, zidovudine

**Y-site incompatibilities:** Amphotericin B colloidal, busulfan, cefepime, cyclopSPORINE, dantrolene, diazepam, DOXOrubicin, IDArubicin, mitoXANtrone, nitroprusside, pantoprazole, phenytoin, thiopental

## ADVERSE EFFECTS

**CNS:** *Headache,* paresthesias, peripheral neuropathy, *hallucinations,* psychosis, EPS, depression, Guillain-Barré syndrome, insomnia, suicidal ideation, dizziness, fever

**CV:** Tachycardia, hyper/hypotension, vasodilatation, atrial dysrhythmias, atrial fibrillation, AV block, bradycardia, HF, MI, QT prolongation, torsades de pointes, peripheral edema

**EENT:** *Blurred vision,* eye hemorrhage, *visual disturbances*

**GI:** *Nausea, vomiting, anorexia, diarrhea,* cramps, hemorrhagic gastroenteritis, acute liver failure, hepatitis, intestinal perforation, pancreatitis

V

**GU:** *Hypokalemia,* azotemia, renal tubular necrosis, permanent renal impairment, anuria, oliguria
**HEMA:** Anemia, eosinophilia, hypomagnesemia, thrombocytopenia, leukopenia, pancytopenia
**INTEG:** *Burning, irritation,* pain, necrosis at inj site with extravasation, dermatitis, *rash,* photosensitivity
**MISC:** Respiratory disorder
**SYST:** Stevens-Johnson syndrome, toxic epidermal necrolysis, sepsis, melanoma (photosensitivity reaction)

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | CYP3A4/CYP2C9 |
| **Excretion** | Via hepatic metabolism |
| **Half-life** | Elimination 6 hr (dose dependent) |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-2 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

CISplatin, cycloSPORINE, polymyxin B, vancomycin: increased nephrotoxicity
CycloSPORINE, phenytoin, pimozide, predniSOLONE, quiNIDine, rifabutin, sirolimus, tacrolimus, warfarin: increased effects of each specific product
Digoxin: increased hypokalemia
Haloperidol, chloroquine, droperidol, pentamidine; arsenic trioxide, levomethadyl: increased QT prolongation

### Drug classifications

Aminoglycosides: increased nephrotoxicity
Benzodiazepines, calcium channel blockers, ergots, HMG-CoA reductase inhibitors, nonnucleoside reverse transcriptase inhibitors, protease inhibitors, proton pump inhibitors, sulfonylureas, vinca alkaloids: increased effects of each specific product
Class IA/III antidysrhythmics, some phenothiazines, beta agonists, local anesthetics, tricyclics, CYP3A4 inhibitors (amiodarone, clarithromycin, erythromycin, telithromycin, troleandomycin); CYP3A4 substrates (methadone, pimozide, QUEtiapine, quiNIDine, risperiDONE, ziprasidone): increased QT prolongation
Corticosteroids, diuretics (thiazide), skeletal muscle relaxants: increased hypokalemia

### Drug/herb

St. John's wort: do not use together

### Drug/food

High-fat foods: avoid use with high-fat meals, take 1 hr before or after a meal

### Drug/lab test

Increased: AST/ALT, alkaline phosphatase, creatinine, bilirubin
Decreased: Hgb/Hct, platelets, WBC

## NURSING CONSIDERATIONS

### Assessment

- Monitor VS q15-30min during first inf; note changes in pulse, B/P
- Monitor I&O ratio; watch for decreasing urinary output, change in specific gravity; discontinue product to prevent permanent damage to renal tubules
- Monitor blood tests: CBC, K, Na, Ca, Mg q2wk; BUN, creatinine weekly
- Monitor weight weekly; if weight increases >2 lb/wk, edema is present; renal damage should be considered
- **Assess for renal toxicity:** increasing BUN, serum creatinine; if BUN is >40 mg/dl or if serum creatinine >3 mg/dl, product may be discontinued or dosage reduced
- **Assess for hepatotoxicity:** increasing AST, ALT, alkaline phosphatase, bilirubin, baseline and periodically
- **Assess for allergic reaction:** dermatitis, rash; product should be discontinued, antihistamines (mild reaction) or EPINEPHrine (severe reaction) administered
- **Assess for hypokalemia:** anorexia, drowsiness, weakness, decreased reflexes, dizziness, increased urinary output, increased thirst, paresthesias
- **Assess for ototoxicity:** tinnitus (ringing, roaring in ears), vertigo, loss of hearing (rare)
- **QT prolongation:** ECG for QT prolongation, ejection fraction; assess for chest pain, palpitations, dyspnea
- **Pregnancy/breastfeeding:** Do not use in pregnancy, may cause fetal harm, do not breastfeed

### Patient/family education

- Teach that long-term therapy may be needed to clear infection (2 wk-3 mo depending on type of infection)
- Advise patient to notify prescriber of bleeding, bruising, or soft tissue swelling
- Teach to take 1 hr before or after meal (PO)

• Advise patient not to drive at night because of vision changes
• Advise to avoid strong, direct sunlight
• Advise women of childbearing age to use effective contraceptive

### Evaluation

**Positive therapeutic outcome**
• Decreased fever, malaise, rash, negative C&S for infecting organism

## vortioxetine

(vor'tye-ox'e-teen)
**Brintellix**
*Func. class.:* Antidepressant
*Chem. class.:* Serotonin modulator

**Do not confuse:** Brintellix/Brilinta

**ACTION:** Reuptake inhibition at the serotonin transporter and agonist, or antagonist effects at serotonin receptors

**Therapeutic outcome:** Decreased depression

**USES:** Major depressive disorder in adults

## CONTRAINDICATIONS

Hypersensitivity, MAOI therapy

**Precautions:** Pregnancy, breastfeeding, seizure disorder, bipolar disorder, hyponatremia, hypovolemia, children, suicidal ideation, abrupt discontinuation, anticoagulant therapy, bleeding, closed-angle glaucoma, geriatrics, hepatic disease

**BLACK BOX WARNING:** Children, suicidal ideation

## DOSAGE AND ROUTES

**Adult: PO** 10 mg/day, may start with 5 mg/day initially, increase to 20 mg/day as tolerated, max 20 mg/day; poor metabolizers of CYP2D6 max 10 mg/day

**Available forms:** Tabs 5, 10, 20 mg

### Implementation

• Give without regard to food

## ADVERSE EFFECTS

**CNS:** Flushing, mania, vertigo, dizziness, suicidal attempts
**GI:** *Nausea,* diarrhea, dyspnea, constipation, *vomiting,* flatulence
**GU:** Impotence, ejaculation/orgasm dysfunction
**INTEG:** Pruritus
**SYST:** Serotonin syndrome, neonatal abstinence syndrome angioedema, pulmonary hypertension in the newborn, SIADH

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 98% |
| **Metabolism** | Unknown |
| **Excretion** | Urine (59%), feces (26%) |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

CarBAMazepine: decreased vortioxetine levels
Lithium, traMADol, traZODone: increased serotonin syndrome

### Drug classifications

Anticoagulants, antiplatelets, NSAIDs, salicylates, thrombolytics: increased bleeding risk
Barbiturates, sedative/hypnotics, other CNS depressants: increased CNS effects
Serotonin receptor agonists, SSRIs, MAOIs, SNRIs (venlafaxine, DULoxetine): increased serotonin syndrome
Tricyclics: increased effect of tricyclics; use cautiously

### Drug/herb

St. John's wort: increased serotonin syndrome

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Mental status: assess mood, sensorium, affect, suicidal tendencies, increase in psychiatric symptoms, depression, panic

• **Serotonin syndrome:** monitor for increased heart rate, sweating, dilated pupils, tremors, twitching, hyperthermia, agitation
• Alcohol consumption: if alcohol is consumed, hold dose until AM
• Sexual dysfunction: assess for impotence
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, do not breastfeed

### Patient/family education

• Teach patient that therapeutic effect may take several wk
• Teach patient to use caution when driving, performing other activities that require alertness, because of drowsiness, dizziness, blurred vision; to report signs, symptoms, or bleeding

V

• Teach patient to avoid alcohol, other CNS depressants

**BLACK BOX WARNING:** Teach patient that suicidal ideas, behaviors may occur in children or young adults

• Teach patient to notify prescriber if pregnant, planning to become pregnant, or breastfeeding, pregnancy

**BLACK BOX WARNING:** Teach patient about the effects of serotonin syndrome: nausea/vomiting, tremors; if symptoms occur, to discontinue immediately, notify prescriber

• Advise patient that decrease in libido or impotence may occur

## Evaluation

**Positive therapeutic outcome**

• Decreased depression

valACYclovir (Rx)
valproic acid (Rx)
vancomycin
vasopressin (Rx)
venetoclax
vigabatrin (Rx)
vinCRIStine (VCR) (Rx)
vitamin A (PO, OTC; IM, Rx)
vitamin $B_{12}$ (cyanocobalamin) (PO, OTC; IM/SUBCUT, Rx)
vitamin D (cholecalciferol, vitamin $D_3$ or ergocalciferol, vitamin $D_2$) (Rx, OTC)
voriconazole (Rx)

valGANciclovir (Rx)
divalproex sodium (Rx)
vardenafil (Rx)
vedolizumab
venlafaxine (Rx)
vilazodone (Rx)
vinorelbine (Rx)
vitamin A acid
vitamin $B_{12}$a (hydroxocobalamin) (vit $B_{12}$) (Rx)
vitamin E (OTC)

vortioxetine

valproate (Rx)
valsartan (Rx)
varenicline (Rx)
vemurafenib
verapamil (Rx)
vinBLAStine (VLB) (Rx)
vismodegib
vitamin $B_1$
vitamin C (ascorbic acid) (OTC, Rx)

vorapaxar

**⚠ HIGH ALERT**

## warfarin (Rx)

(war′far-in)

**Coumadin, Jantoven, Warfilone** 🍁

*Func. class.:* Anticoagulant

**Do not confuse:** Coumadin/Cardura/Avandia Jantoven/Janumet/Januvia

**ACTION:** Interferes with blood clotting by indirect means; depresses hepatic synthesis of vit K–dependent coagulation factors (II, VII, IX, X)

**Therapeutic outcome:** Prevention of clotting or pulmonary embolism

**USES:** Antiphospholipid antibody syndrome, arterial thromboembolism prophylaxis, deep vein thrombosis, MI prophylaxis, post MI, stroke prophylaxis, thrombosis prophylaxis, pulmonary embolism

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypersensitivity, hemophilia, leukemia with bleeding, peptic ulcer disease, thrombocytopenic purpura, hepatic disease (severe), malignant hypertension, subacute bacterial endocarditis, acute nephritis, blood dyscrasias, preeclampsia, eclampsia, hemorrhagic tendencies, surgery of CNS, eye, traumatic surgery with large open surface, bleeding tendencies of GI/GU/respiratory, stroke, aneurysms, pericardial effusion, spinal puncture, major regional/lumbar block anesthesia

**BLACK BOX WARNING:** Bleeding

**Precautions:** Alcoholism, geriatric, HF, debilitated patients, trauma, indwelling catheters, severe hypertension, active infections, protein C deficiency, polycythemia vera, vasculitis, severe diabetes, Asian patients (CYP2C9, protein C,S deficiency)

## DOSAGE AND ROUTES

**Adult:** PO 2-10 mg/day × 3 days, then titrated to INR/pro-time

**Adolescent/child/infant:** PO 0.2 mg/kg/day titrated to INR

**Available forms:** Tabs 1, 2, 2.5, 3, 4, 5, 6, 7.5, 10 mg

### Implementation

**PO route**

- Warfarin is usually given with **IV** heparin for 3 or more days, warfarin blood level may take several days

## ADVERSE EFFECTS

**CNS:** *Fever,* dizziness, fatigue, headache, lethargy

**CV:** Angina, chest pain, edema, hypotension, syncope

**GI:** *Diarrhea,* nausea, vomiting, anorexia, stomatitis, cramps, hepatitis, cholestatic jaundice

**GU:** Hematuria

**HEMA:** Hemorrhage, agranulocytosis, leukopenia, eosinophilia, ecchymosis, anemia, petechiae

**INTEG:** *Rash,* dermatitis, urticaria, alopecia, pruritus

**MISC:** Epistaxis, hemoptysis, mouth ulcers, taste disturbances, priapism, dyspnea

**MS:** Bone fractures

**SYST:** Anaphylaxis, coma, cholesterol, microembolisms, exfoliative dermatitis, purple toe syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO), completely absorbed |
| **Distribution** | Crosses placenta, 99% plasma protein binding |
| **Metabolism** | Liver |
| **Excretion** | Kidney, feces (active, inactive metabolites) |
| **Half-life** | Effective ½-2½ days |

### Pharmacodynamics

| | PO |
|---|---|
| **Onset** | 12-24 hr |
| **Peak** | ½-4 days |
| **Duration** | 3-5 days |

## INTERACTIONS

### Individual drugs

Allopurinol, amiodarone, chloral hydrate, chloramphenicol, cimetidine, clofibrate, clotrimoxazole, dextrothyroxine, diflunisal, disulfiram, erythromycin, furosemide, glucagon, heparin, indomethacin, isoniazid, mefenamic acid, metroNIDAZOLE, mifepristone, phenylbutazone, quiNIDine, RU-486, sulfinpyrazone, sulindac, thyroid: increased warfarin action

Aprepitant, azoTHIOprine, bosentan, carBAMazepine, dicloxicillin, ethchlorvynol, factor IX/ VIIa, griseofulvin, nafcillin, phenytoin, rifampin, sucralfate, sulfaSALAzine, thyroid, vitamin K: decreased warfarin action

Phenytoin: increased toxicity

W

### Drug classifications

Antidepressants (tricyclic), ethacrynic acids, HMG-CoA reductase inhibitors, NSAIDs, oxyphenbutazones, COX-2 selective inhibitors, penicillins, quinolones, salicylates, selective serotonin reuptake inhibitors, steroids, sulfonamides, thrombolytics: increased warfarin action

Barbiturates, bile acid sequestrants, contraceptives (oral), estrogens: decreased warfarin action

Sulfonylureas (oral): increased toxicity

### Drug/herb

*Anise, chamomile, dong quai, evening primrose, feverfew, garlic, ginger, ginkgo, ginseng, horse chestnut, kava, licorice, melatonin, red yeast rice, saw palmetto: increased risk of bleeding*

Coenzyme Q10, St. John's wort: decreased anticoagulant effect

### Drug/food

Vit K foods: decreased warfarin action

### Drug/lab test

Increased: $T_3$ uptake, liver function tests

Decreased: uric acid

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Monitor blood studies (Hct, PT, platelets, occult blood in stools) q3mo; INR: in hospital daily after 2nd or 3rd dose; once in therapeutic range for 2 consecutive days, monitor 2-3× wk for 1-2 wk, then less frequently depending on stability of INR results; *Outpatient:* monitor every few days until stable dose, then periodically thereafter depending on stability of INR results, usually at least monthly

**BLACK BOX WARNING:** Assess for bleeding gums, petechiae, ecchymosis, black tarry stools, hematuria, occult, cerebral, (intra abdominal); fatal hemorrhage can occur

- Monitor B/P, watch for increasing signs of hypertension
- Assess for fever, skin rash, urticaria
- Assess for needed dosage change q1-2wk

### Patient/family education

- Caution patient to avoid OTC preparations unless directed by prescriber; may cause serious product interactions; avoid alcohol
- Advise patient that product may be withheld during active bleeding (menstruation), depending on condition
- Advise patient to use soft-bristle toothbrush to avoid bleeding gums, avoid contact sports, use electric razor, avoid IM inj
- Instruct patient to carry/wear emergency ID identifying product taken

**BLACK BOX WARNING:** Advise patient to report any signs of bleeding: nosebleed, gums, under skin, urine, stools

- Teach patient to read food labels; limited intake of vit K foods (green leafy vegetables) is necessary to maintain consistent prothrombin levels

### Evaluation

**Positive therapeutic outcome**

- Decrease of deep vein thrombosis
- Pro-time (1.3-2.0 × control)
- Absence of pulmonary embolism

**e22**

warfarin (Rx)

## zafirlukast (Rx)

(za-feer'loo-cast)
**Accolate**
*Func. class.:* Bronchodilator
*Chem. class.:* Leukotriene receptor antagonist

**Do not confuse:** Accolate/Accupril/Aclovate

**ACTION:** Antagonizes the contractile action of leukotrienes ($LTC_4$, $LTD_4$, $LTE_4$) in airway smooth muscle; inhibits bronchoconstriction caused by antigens

**Therapeutic outcome:** Ability to breathe more easily

**USES:** Prophylaxis and treatment of chronic asthma in adults/children >5 yr

### CONTRAINDICATIONS

Hypersensitivity, hepatic encephalopathy

**Precautions:** Pregnancy, breastfeeding, children, geriatric, hepatic disease, Churg-Strauss syndrome, acute bronchospasm

### DOSAGE AND ROUTES

**Adult and child ≥12 yr:** PO 20 mg bid
**Child 5-11 yr:** PO 10 mg bid

**Available forms:** Tabs 10, 20 mg

#### Implementation

- Give PO 1 hr before or 2 hr after meals; absorption may be decreased if given with food

### ADVERSE EFFECTS

**CNS:** Headache, dizziness, suicidal ideation, fever, insomnia
**GI:** Nausea, diarrhea, abdominal pain, vomiting, dyspepsia, hepatic failure, hepatitis
**HEMA:** Agranulocytosis
**MISC:** Infections, pain, asthenia, myalgia, fever, increased ALT, urticaria, rash, angioedema

#### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Extensively by CYP2C9, CYP3A4 enzyme systems, protein binding (99%) |
| **Excretion** | Feces |
| **Half-life** | 10 hr |

#### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 3 hr |
| **Duration** | Unknown |

### INTERACTIONS

#### Individual drugs

Aspirin: increased plasma levels of zafirlukast
Erythromycin, theophylline: decreased plasma levels of zafirlukast
Warfarin: increased pro-time

#### Drug/food

Decreased: bioavailability of zafirlukast

### NURSING CONSIDERATIONS

#### Assessment

- Assess respiratory rate, rhythm, depth; auscultate lung fields bilaterally; notify prescriber of abnormalities; not to be used for acute bronchospasm in acute asthma
- **Churg-Strauss syndrome (rare):** assess adults carefully (eosinophilia, vasculitic rash, worsening pulmonary symptoms, cardiac complications, neuropathy), may be caused by reducing oral corticosteroids
- **Hepatic disease:** Monitor liver function tests
- Assess for renal/pancreatic/visual function
- **Pregnancy/breastfeeding:** Use only if clearly needed, do not breastfeed, excreted in breast milk

#### Patient/family education

- Advise patient to check OTC medications, current prescription medications that may increase stimulation, do not stop other asthma medications unless instructed to do so
- Advise patient to avoid hazardous activities; dizziness may occur
- Advise patient that if GI upset occurs, to take product with 8 oz of water, take 1-2 hr after a meal; avoid food if possible; absorption may be decreased
- Advise to take even if symptom-free
- Advise patient to notify prescriber of nausea, vomiting, diarrhea, abdominal pain, fatigue, jaundice, anorexia, flulike symptoms (hepatic dysfunction)
- Advise patient not to use for acute asthma episodes
- Teach patient not to breastfeed

#### Evaluation

**Positive therapeutic outcome**
- Ability to breathe more easily

**⚠ HIGH ALERT**

## zaleplon (Rx)

(zal'eh-plon)
**Sonata**
*Func. class.:* Hypnotic, nonbarbiturate
*Chem. class.:* Pyrazolopyrimidine
**Controlled substance schedule IV**

**Do not confuse:** Sonata/Soriatane

**ACTION:** Binds selectively to ω-1 receptor of the γ-aminobutyric acid type A ($GABA_A$) receptor complex; results are sedation, hypnosis, skeletal muscle relaxation, anticonvulsant activity, anxiolytic action

**Therapeutic outcome:** Ability to sleep

**USES:** Insomnia (short-term treatment)

## CONTRAINDICATIONS

Hypersensitivity, severe hepatic disease

**Precautions:** Pregnancy, breastfeeding, children <15 yr, geriatric, renal/hepatic disease, psychosis, angioedema, respiratory disease, depression, sleep-related behavior (sleep walking), Asian descent, CNS depression

## DOSAGE AND ROUTES

**Adult:** PO 10 mg at bedtime; may increase dosage to 20 mg at bedtime if needed; 5 mg may be used in low-weight persons
**Geriatric:** PO 5 mg at bedtime; may increase if needed

**Available forms:** Caps 5, 10 mg

### Implementation

- Give ½-1 hr before bedtime for sleeplessness; give on empty stomach
- Store in tight container in cool environment

## ADVERSE EFFECTS

**CNS:** *Drowsiness,* amnesia, depersonalization, hallucinations, hyperesthesia, paresthesia, somnolence, tremor, vertigo, dizziness, anxiety, *lethargy, daytime sedation,* confusion, complex sleep-related reactions (sleep driving, sleep eating)
**CV:** Chest pain, peripheral edema
**EENT:** Vision changes, ear/eye pain, hyperacusis, parosmia
**GI:** Nausea, anorexia, colitis, dyspepsia, dry mouth, constipation, abdominal pain
**MISC:** Asthenia, fever, headache, myalgia, dysmenorrhea
**MS:** Myalgia, back pain, arthritis
**RESP:** Bronchitis
**SYST:** Severe allergic reactions

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Extravascular tissues, crosses blood-brain barrier; crosses placenta |
| **Metabolism** | Extensively, liver to inactive metabolites |
| **Excretion** | Kidneys |
| **Half-life** | 1 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Rapid |
| **Peak** | 1 hr |
| **Duration** | 3-4 hr |

## INTERACTIONS

### Individual drugs

Cimetidine: increased action of zaleplon

### Drug classifications

CYP3A4 inhibitors/inducers: increased or decreased zaleplon levels

### Drug/herb

Chamomile, hops, kava, valerian: increased CNS depression

### Drug/food

High-fat/heavy meal: prolonged absorption, sleep onset reduced

## NURSING CONSIDERATIONS

### Assessment

- **Sleep disorders:** assess for type of sleep problem, falling asleep, staying asleep; monitor for complex sleep disorders
- Assess for previous product dependence or tolerance; if product dependent or tolerant, amount of medication should be restricted
- **Pregnancy/breastfeeding:** Avoid in pregnancy, breastfeeding
- Monitor patient's mental status: mood, sensorium, affect, sleeping patterns, drowsiness, dizziness, suicidal tendencies, excessive sedation, impaired coordination
- **Beers:** Avoid in older adults with or at high risk for delirium, potential for worsening or inducing delirium

### Patient/family education

- Inform patient that product is for short-term use only
- Teach patient to take immediately before going to bed
- Advise patient that product may cause memory problems, dependence (if used for longer periods of time), changes in behavior/thinking, complex sleep-related behavior (sleep eating/driving)
- Advise patient not to ingest a high-fat/heavy meal before taking
- Advise patient to avoid OTC preparations unless approved by a physician, to avoid alcohol ingestion or other psychotropic medications unless prescribed by a health care provider, that 1-2 wk of therapy may be required before therapeutic effects occur
- Caution patient to avoid driving, activities requiring alertness; drowsiness may occur; until

medication response is known, tell patient that drowsiness may worsen at beginning of treatment
• Instruct patient not to discontinue medication abruptly after long-term use

### Evaluation

**Positive therapeutic outcome**
• Decreased sleeplessness

## zanamivir (Rx)

(zan-a-mee′veer)
**Relenza**
*Func. class.:* Antiviral
*Chem. class.:* Neuraminidase inhibitor

**ACTION:** Inhibits neuramidase enzyme needed for influenza virus replication

**Therapeutic outcome:** Decreased symptoms of influenza types A and B for those who have been symptomatic for no more than 2 days

**USES:** Treatment of influenza types A and B for those who have been symptomatic for no more than 2 days, seasonal influenza prophylaxis

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children <7 yr, geriatric, respiratory disease, angioedema, milk protein hypersensitivity, Reye's syndrome

## DOSAGE AND ROUTES

**Adult and child >7 yr:** INH 2 inh (two 5-mg blisters) q12hr × 5 days, on the 1st day 2 doses should be taken with at least 2 hr between doses

**Available forms:** Blisters of powder for inhalation 5 mg

### Implementation

• Give before exposure to influenza; continue for 5 days after contact
• Store in airtight, dry container

## ADVERSE EFFECTS

**CNS:** *Headache, dizziness,* fatigue, seizures, self-injury, delirium (child)
**EENT:** Ear, nose, throat infections, throat discomfort
**GI:** *Nausea, vomiting, diarrhea*
**RESP:** Nasal symptoms, cough, sinusitis, bronchitis, bronchospasm
**SYST:** Angioedema

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 4%-17% absorbed |
| **Distribution** | <10% protein binding |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys unchanged |
| **Half-life** | 2½-5 hr |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Individual drugs

Intranasal influenza vaccine: decreased effect; separate by ≥48 hr, do not restart antiviral drugs for ≥2 wk

## NURSING CONSIDERATIONS

### Assessment

• **Influenza:** headache, joint aches/pain, fever, cough, sore throat, baseline and periodically through treatment, only used in those who are symptomatic ≤ 2 days
• Assess for symptoms of influenza A: increased temp, malaise, aches and pains
• Assess for skin eruptions, photosensitivity after administration of product
• Monitor respiratory status: rate, character, wheezing, tightness in chest
• Assess for allergies before initiation of treatment, reaction of each medication
• **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, avoid use in breastfeeding

### Patient/family education

• Give patient "Patient's instructions for use" and review all points before using delivery system
• Teach patient to avoid hazardous activities if dizziness occurs
• Teach patient to use for the entire 5 days
• Inform patient that this product does not reduce transmission risk of influenza to others
• Advise patients with asthma or COPD to carry a fast-acting inhaled bronchodilator since bronchospasm may occur; to use scheduled inhaled bronchodilators before using this product, avoid use in those who are lactose intolerant
• Teach patient to use as directed, finish all medication
• Teach patient to avoid use if pregnant or breastfeeding

### Evaluation

**Positive therapeutic outcome**
• Absence of fever, malaise, cough, dyspnea in influenza A

Z

## zidovudine (Rx)

(zye-doe'vue-deen)
**Novo-AZT, Retrovir**
*Func. class.:* Antiretroviral
*Chem. class.:* Nucleoside reverse transcriptase inhibitor (NRTI)

**Do not confuse:** Retrovir/ritonavir

**ACTION:** Inhibits replication of HIV-1 by incorporating into cellular DNA by viral reverse transcriptase, thereby terminating the cellular DNA chain

**Therapeutic outcome:** Decreased symptoms of HIV-1 infection

**USES:** Used in combination with at least 2 other antiretrovirals for HIV-1 infection

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, granulocyte count $<1000/mm^3$ or Hgb <9.5 g/dl, severe renal disease, obesity

**BLACK BOX WARNING:** Hepatotoxicity, anemia, lactic acidosis, myopathy, neutropenia

## DOSAGE AND ROUTES

### For the treatment of human immunodeficiency virus (HIV) infection in combination with other antiretroviral agents

**Adults:** PO 300 mg BID or 200 mg TID; IV Infusion 1 mg/kg over 1 h q 4 h around the clock (total daily dose: 6 mg/kg/day). Initiate oral therapy as soon as possible. Monotherapy with zidovudine is not recommended for treatment of HIV

**Children and Adolescents:** ≥ 30 kg PO 300 mg BID (preferred) or 200 mg TID

**Infants and Children:** 9 to 29 kg PO 9 mg/kg/dose BID (preferred) or 6 mg/kg/dose tid

- Infants and Children 4 to 8 kg PO 12 mg/kg/dose BID (preferred) or 8 mg/kg/dose TID
- Neonates 35 wks gestational age and older (unlableled) PO 4 mg/kg/dose BID initially; increase to 12 mg/kg/dose BID after 4 wks of age.
- Premature Neonates 30 to 34 wks gestational age (unlabeled) PO 2 mg/kg/dose BID initially Increase to 3 mg/kg/dose BID at 2 wks of age, and then increase to 12 mg/kg/dose BID after 6 to 8 wks of age
- Premature Neonates less than 30 weeks gestational age† 2 mg/kg/dose PO twice daily initially. Increase to 3 mg/kg/dose PO twice daily at 4 weeks of age, and then increase to 12 mg/kg/dose PO twice daily after 8 to 10 weeks of age

### For perinatal human immunodeficiency virus (HIV) prophylaxis

Pregnant Females (intrapartum) IV Infusion 2 mg/kg over 1 h, followed by 1 mg/kg/h IV continuous infusion until clamping of the umbilical cord

Neonates ≥ 35 wks gestational age IV 3 mg/kg/dose q 12 h beginning as soon as possible after birth (preferably within 6 to 12 hours). Increase to 9 mg/kg/dose Iq12 h after 4 wks of age

### Renal dose

**Adult:** PO CCr 15 mL/min or more: No change; CCr <15 mL/min: 100 mg q 8 h or 300 mg q day

**Pediatric patients:** PO GFR 10 mL/min/1.73 m2 or more: No change; GFR <10 mL/min/1.73 m2: Reduce dose by 50%

**Available forms:** Caps 100 mg; tabs 300 mg; inj 10 mg/ml; oral syr 50 mg/5 ml

### Implementation

**PO route**

- Give on empty stomach
- Do not take dapsone at same time as didanosine
- Store in cool environment; protect from light

**Intermittent IV infusion route**

- Give after diluting with $D_5W$; give over 1 hr (<4 mg/ml), do not give by direct **IV**
- Protect unopened product from light; use diluted solutions within 24 hr if stored at room temperature, 48 hr if refrigerated

**Y-site compatibilities:** Acyclovir, alemtuzumab, allopurinol, amikacin, amphotericin B, anidulafungin, argatroban, aztreonam, ceftazidime, cefTRIAXone, cimetidine, clindamycin, dexamethasone, DOBUTamine, DOPamine, erythromycin, fluconazole, fludarabine, gentamicin, heparin, imipenem/cilastatin, LORazepam, metoclopramide, morphine, nafcillin, ondansetron, oxacillin, pentamidine, phenylephrine, piperacillin, potassium chloride, ranitidine, sargramostim, tacrolimus, tobramycin, trimethoprim/sulfamethoxazole, vancomycin, zoledronic acid

**Additive incompatibilities:** Blood products or protein solutions

## ADVERSE EFFECTS

**CNS:** *Fever, headache, malaise,* diaphoresis, *dizziness, insomnia,* paresthesia, somnolence, chills, tremor, twitching, anxiety, confusion, depression, lability, vertigo, loss of mental acuity, seizures, malaise

**EENT:** Taste change, hearing loss, photophobia
**GI:** *Nausea, vomiting, diarrhea,* anorexia, cramps, *dyspepsia, constipation,* dysphagia, *flatulence,* rectal bleeding, mouth ulcer, abdominal pain, hepatomegaly
**GU:** Dysuria, polyuria, frequency, hesitancy
**HEMA:** Granulocytopenia, anemia
**INTEG:** *Rash,* acne, pruritus, urticaria
**MS:** Myalgia, arthralgia, muscle spasm
**RESP:** Dyspnea, cough, wheezing
**SYST:** Lactic acidosis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Well absorbed (PO), completely absorbed (**IV**) |
| **Distribution** | Widely distributed—crosses placenta, CSF, protein binding 38% |
| **Metabolism** | Liver, mostly |
| **Excretion** | Kidneys |
| **Half-life** | Terminal ½-3 hr |

### Pharmacodynamics

| | PO | IV |
|---|---|---|
| **Onset** | Unknown | Rapid |
| **Peak** | ½-1½ hr | Inf end |
| **Duration** | Unknown | Unknown |

## INTERACTIONS

### Individual drugs

DOXOrubicin, ribavirin, staduvine: avoid concurrent use
Ganciclovir, radiation, SMZ/TMP, valganciclovir: increased bone marrow suppression
Methadone: increased zidovudine level

### Drug classifications

Antineoplastics: increased bone marrow suppression
Interferons, NRTIs: decreased zidovudine levels

### Drug/lab test

Increased: LFTs, granulocytes
Decreased: platelets, amylase, CPK

## NURSING CONSIDERATIONS

### Assessment

- HIV: Monitor symptoms of HIV baseline and throughout treatment
- **Assess for peripheral neuropathy:** tingling or pain in hands and feet, distal numbness; if these occur, product may be decreased or discontinued
- **Assess for pancreatitis:** abdominal pain, nausea, vomiting, elevated liver enzymes; product should be discontinued because condition can be fatal
- Assess children by dilated retinal examination q6mo to rule out retinal depigmentation

**BLACK BOX WARNING: Bone marrow suppression:** Monitor blood counts q2wk; watch for decreasing granulocytes, Hgb; if low, therapy may have to be discontinued and restarted after hematologic recovery; blood transfusions may be required; monitor viral load, CD4 counts, LFTs, plasma HIV RNA, serum creatinine/BUN baseline and throughout treatment

- Monitor lipid profile, blood glucose, hepatitis B serology, plasma hepatitis C RNA, more common in females

**BLACK BOX WARNING: Lactic acidosis, severe hepatomegaly with steatosis:** obtain baseline LFTs; if elevated, discontinue treatment; discontinue even if LFTs are normal but lactic acidosis, hepatomegaly are present: may be fatal

- **Pregnancy/breastfeeding:** Register pregnant patients at the Antiretroviral Pregnancy Registry 800-258-4263, do not breastfeed, excreted in breast milk

### Patient/family education

- Caution patient to take on empty stomach; to use exactly as prescribed
- Advise patient to report signs of infection: increased temp, sore throat, shortness of breath flulike symptoms; to avoid crowds and those with known infections; to avoid crowds or people with known infections
- Advise that fainting, dizziness may occur, to avoid driving or other hazardous activities until response is known
- Instruct patient to report signs of anemia: fatigue, headache, faintness, shortness of breath, irritability
- Advise patient to report bleeding; avoid use of razors or commercial mouthwash
- Inform patient that hair may be lost during therapy (rare); a wig or hairpiece may make patient feel better
- Caution patient to avoid OTC products or other medications without approval of prescriber serious drug interactions may occur
- Caution patient not to have any sexual contact without use of a condom; needles should not be shared; blood from infected individual should not come in contact with another's mucous membranes, compliance with treatment is required
- Teach patient that redistribution of body fat may occur
- Teach patient not to breastfeed during treatment

Z

### Evaluation

**Positive therapeutic outcome**
- Decreased infection; decreased symptoms of HIV infection, decreased viral load, increased CD4 counts

## zinc (PO, OTC; IV, Rx)

(zink sul′fate)
**Orazinc, PMS Egozinc, Verazinc, Zinca-Pak, Zincate, Zinc 15, Zinc-220**
*Func. class.:* Trace element; nutritional supplement

**ACTION:** Needed for adequate healing, bone and joint development, (23% zinc)

**Therapeutic outcome:** Replacement of zinc

**USES:** Prevention of zinc deficiency, adjunct to vit A therapy

**Unlabeled uses:** Wound healing

**Precautions:** Pregnancy (parenteral), breastfeeding, hypocupremia, neonatal prematurity, neonates, renal disease

## DOSAGE AND ROUTES

### Dietary supplement (elemental zinc)

**Adult/adolescent pregnant females:** PO 11-13 mg/day

### Nutritional supplement (IV)

**Adult:** **IV** 2.5-4 mg/day, may increase by 2 mg/day if needed
**Child 1-5 yr:** **IV** 50 mcg/kg/day
**Adult and lactating female:** PO 12-14 mg/day × 12 mo
**Adult and adolescent male ≥14 yr:** PO 11 mg/day
**Adult female ≥19 yr:** PO 8 mg/day
**Adolescent female ≥14 yr:** PO 9 mg/day
**Child 9-13 yr:** PO 8 mg/day
**Child 4-8 yr:** PO 5 mg/day
**Child 1-3 yr:** PO 3 mg/day
**Infant 7-12 mo:** PO 3 mg/day
**Infant birth to 6 mo:** PO 2 mg/day (adequate intake)

### Wound healing (unlabeled)

**Adult:** PO 50 mg tid until healed (elemental iron)

**Available forms:** Tabs 66, 110 220 mg; inj 1, 5 mg/ml, Caps 25, 50 mg

### Implementation

**PO route**
- Give with meals to decrease gastric upset; restrict dairy products, caffeine, which decrease absorption

**IV route**
- Part of TPN

## ADVERSE EFFECTS

**GI:** Nausea, vomiting, cramps, heartburn, ulcer formation

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Poorly absorbed (**PO**), completely absorbed (**IV**) |
| **Distribution** | Widely distributed |
| **Metabolism** | Liver |
| **Excretion** | 90% (feces), 10% (kidneys) |
| **Half-life** | Unknown |

### Pharmacodynamics

Unknown

## INTERACTIONS

### Drug classifications

Fluoroquinolones, tetracyclines: decreased absorption

### Drug/food

Caffeine, dairy products: decreased absorption of PO zinc

## NURSING CONSIDERATIONS

### Assessment

- Zinc deficiency: poor wound healing, absence of taste, smell, slowing growth
- Alkaline phosphatase, HDL monthly in long-term therapy
- Monitor zinc levels during treatment, CBC
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk (IV), considered safe in breastfeeding

### Patient/family education

- Inform patient that element must be taken for 3 mo to be effective
- Advise patient to report immediately nausea, diarrhea, rash, severe vomiting, restlessness, abdominal pain, tarry stools

### Evaluation

**Positive therapeutic outcome**
- Absence of zinc deficiency
- Improved wound healing

**OVERDOSE:** Diarrhea, rash, dehydration, restlessness

## ziprasidone (Rx)

(zi-praz′ih-dohn)
**Geodon, Zeldox**
*Func. class.:* Antipsychotic/neuroleptic
*Chem. class.:* Benzisoxazole derivative

**ACTION:** Unknown; may be mediated through both dopamine type 2 ($D_2$) and serotonin type 2 ($5\text{-}HT_2$) antagonism

**Therapeutic outcome:** Decreased signs/symptoms of psychosis

**USES:** Schizophrenia, acute agitation, acute psychosis, bipolar disorder, mania, psychotic depression, agitation

## CONTRAINDICATIONS

Hypersensitivity, breastfeeding

**Precautions:** Pregnancy, children, geriatric, renal/cardiac/hepatic disease, breast cancer, diabetes, AV block, CNS depression, seizure disorders, abrupt discontinuation, agranulocytosis, ambient temperature increase, suicidal ideation, torsades de pointes, strenuous exercise

**BLACK BOX WARNING:** Increased mortality in elderly patients with dementia-related psychosis

## DOSAGE AND ROUTES

### Schizophrenia

**Adult:** PO 20 mg bid with food, adjust dosage every 2 days upward to max of 80 mg bid; IM 10-20 mg; may give 10 mg q2hr, doses of 20 mg may be given q4hr, max 40 mg/day (acute episodes); switch to PO as soon as possible

### Bipolar disorder

**Adult:** PO 40 mg bid with food, on day 2 increase to 60 or 80 mg bid, then adjust to response; maintenance as adjunct to lithium/valproate 40-80 mg bid

**Available forms:** Tabs 20, 40, 60, 80 mg; inj 20 mg/ml single-dose vials

### Implementation

- Give reduced dosage in geriatric
- Give antiparkinsonian agent on order from prescriber, to be used for EPS
- Provide decreased stimulus by dimming lights, avoiding loud noises
- Store in tight, light-resistant container
- Provide supervised ambulation until patient is stabilized on medication; do not involve in strenuous exercise program because fainting is possible; patient should not stand still for a long time

**PO route**

- Take cap whole and with food, with plenty of fluid at same time of day
- Food increases absorption
- Store in airtight, light-resistant container

**IM route**

- Add 1.2 ml sterile water for inj to vial, shake vigorously until product is dissolved; give deeply in large muscle; do not mix with other products; do not use if particulates are present, keep patient recumbent for 30 min after injection
- Store injection at room temperature; protect from light; after reconstituting may be stored at room temperature × 24 hr, 7 days refrigerated

## ADVERSE EFFECTS

**CNS:** *EPS (pseudoparkinsonism, akathisia, dystonia, tardive dyskinesia), drowsiness, insomnia, agitation, anxiety, headache,* seizures, neuroleptic malignant syndrome, dizziness, tremor, facial droop
**CV:** Orthostatic hypotension, tachycardia, prolonged QT/QTc, sudden death, heart failure (geriatric), torsades de pointes
**EENT:** Blurred vision, diplopia
**ENDO:** Metabolic changes, hyperprolactinemia (rare)
**GI:** *Nausea,* vomiting, *anorexia, constipation,* jaundice, weight gain, diarrhea, dry mouth, abdominal pain
**GU:** Enuresis, urinary incontinence, gynecomastia, impotence, priapism
**MS:** Decreased bone density
**RESP:** Rhinitis, dyspnea, infection, cough
**INTEG:** Rash, inj site pain, sweating

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 99% |
| **Metabolism** | Liver, extensively to metabolite |
| **Excretion** | Unknown |
| **Half-life** | Terminal 7 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | PO 6-8 hr; IM 60 min |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol: increased sedation
Chloroquine, clarithromycin, droperidol, erythromycin, grepafloxacin, haloperidol, methadone, moxifloxacin, pentamidine: increased QT prolongation
CarBAMazepine, phenytoin, rifampin: increased excretion of ziprasidone
Ketoconazole: increased ziprasidone level
Lithium: increased EPS, possible neurotoxicity

### Drug classifications

Antihypertensives: increased hypotension
Antipsychotics: increased EPS

β-agonists, class IA/III antidysrhythmics, local anesthetics, phenothiazines (some), tricyclics: increased QT prolongation
Barbiturates: increased excretion of ziprasidone
CNS depressants: increased sedation
SSRIs, SNRIs: increased serotonin syndrome, increased neuroleptic malignant syndrome

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Assess geriatric with dementia closely; heart failure, sudden death have occurred

- Assess mental status before initial administration, AIMS assessment
- Monitor bilirubin, CBC, liver function tests, fasting blood glucose, cholesterol profile; potassium, magnesium when taken with loop/thiazide diuretics qmo
- Monitor urinalysis before, during prolonged therapy
- Monitor B/P standing and lying; also pulse, respirations; take these q4hr during initial treatment; establish baseline before starting treatment; report drops of 30 mm Hg; watch for ECG changes; QT prolongation may occur, QTc >500 msec should have products discontinued
- Assess dizziness, faintness, palpitations, tachycardia on rising
- **Assess EPS,** including akathisia (inability to sit still, no pattern to movements), tardive dyskinesia (bizarre movements of the jaw, mouth, tongue, extremities), pseudoparkinsonism (rigidity, tremors, pill rolling, shuffling gait)
- **Assess for neuroleptic malignant syndrome:** hyperthermia, increased CPK, altered mental status, muscle rigidity
- Assess constipation, urinary retention daily; if these occur, increase bulk and water in diet
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, may cause EPS in the neonate, enroll in the Atypical Antipsychotic Pregnancy Registry 866-961-2388, avoid breastfeeding, excretion unknown
- **Beers:** Avoid use in older adults except for schizophrenia, bipolar disorder, or short-term as an antiemetic during chemotherapy, increased risk of stroke and cognitive decline

### Patient/family education

- Advise patient that orthostatic hypotension may occur and to rise from sitting or lying position gradually; avoid hot tubs, hot showers, tub baths because hypotension may occur
- Advise patient to avoid abrupt withdrawal of this product; EPS may result; product should be withdrawn slowly
- Advise patient to avoid OTC preparations (cough, hay fever, cold) unless approved by prescriber, since serious product interactions may occur; avoid use with alcohol, CNS depressants; increased drowsiness may occur
- Teach patient to avoid hazardous activities if drowsy or dizzy
- Advise patient to increase fluids to prevent constipation
- Teach patient to use sips of water, candy, gum for dry mouth
- Teach patient to report impaired vision, tremors, muscle twitching
- Teach patient that in hot weather, heat stroke may occur; take extra precautions to stay cool, take adequate liquids

### Evaluation

**Positive therapeutic outcome**

- Decrease in emotional excitement, hallucinations, delusions, paranoia; reorganization of patterns of thought, speech

## TREATMENT OF OVERDOSE:

Lavage if orally ingested; provide airway; *do not induce vomiting*

**⚠ HIGH ALERT**

## ziv-aflibercept

(ziv-a-flih'ber-sept)
**Zaltrap**
*Func. class.:* Antineoplastic
*Chem. class.:* Signal transduction inhibitor (STI), fusion protein

**ACTION:** An angiogenesis inhibitor, a fusion protein that binds to vascular endothelial growth factors (VEGF-A, VEGF-B) and placental growth factor 1 and 2

**Therapeutic outcome:** Decrease in spread or size of tumor

**USES:** Metastatic colorectal cancer that is resistant or has progressed after an oxaliplatin-containing regimen in combination with 5-fluorouracil, leucovorin, irinotecan (FOLFIRI)

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Infertility, male-mediated teratogenicity, encephalopathy, hypertension, dental work, breastfeeding, children, neonates, geriatric patients, infection, neutropenia, pregnancy

**BLACK BOX WARNING:** Bleeding, GI bleeding/perforation, intracranial bleeding, surgery

## DOSAGE AND ROUTES

**Adult: IV** 4 mg/kg over 1 hr on day 1 every 2 wk in combination with the FOLFIRI regimen (irinotecan 180 mg/m$^2$ over 90 min on day 1 with dl-racemic leucovorin 400 mg/m$^2$ over 2 hr) (infused at the same time, in same Y-line; then on day 1 by 5-fluorouracil 400 mg/m$^2$ as a bolus, then 2400 mg/m$^2$ as a 46-hr cont IV inf)

**Available forms:** Solution for injection 100 mg/4 ml; 200 mg/8 ml

### Implementation

• Give before FOLFIRI chemotherapy; visually inspect for particulate matter and discoloration before use

**Dilution and preparation**

• Withdraw the calculated dose, add to 0.9% sodium chloride or dextrose 5% solution to 0.6–8 mg/mL; use polyvinyl chloride (PVC) infusion bags containing bis (2-ethylhexyl) phthalate (DHEP) or polyolefin infusion bags; do not re-enter the vial after first puncture; discard any unused portion; do not mix or combine with other drugs in the same infusion bag; the diluted solution may be stored refrigerated for ≤4 hr; discard any unused portion in the infusion bag

**IV infusion**

• Give diluted solution over 1 hr using a 0.2 micrometer polyethersulfone filter; do not use nylon or polyvinylidene fluoride (PVDF) filters; do not give IV push or bolus; do not mix or combine with other drugs in the same IV line; give using an infusion set made of one of the following: PVC containing DEHP, DEHP-free PVC containing trioctyl-trimellitate (TOTM), polypropylene, polyethylene-lined PVC, or polyurethane

**Dosage adjustments for recurrent or severe hypertension**

Hold until B/P is controlled and then permanently reduce dose to 2 mg/kg; discontinue in hypertensive crisis or hypertensive encephalopathy

**Dosage adjustments for proteinuria (2 g/24 hr)**

Hold until proteinuria is <2 g/24 hr; if proteinuria recurs, hold therapy until proteinuria is <2 g/24 hr, then reduce to 2 mg/kg; discontinue in nephrotic syndrome or thrombotic microangiopathy

## ADVERSE EFFECTS

**CNS:** Intracranial bleeding, *headache, dizziness,* reversible posterior leukoencephalopathy
**CV:** Hypertensive crisis, *hypertension,* stroke
**GI:** Nausea, hepatotoxicity, dyspepsia, GI hemorrhage, *abdominal pain,* GI perforation
**GU:** Proteinuria, hematuria
**HEMA:** Neutropenia, leukopenia
**INTEG:** Rash, pruritus, alopecia, hypersensitivity, palmar plantar erythrodysesthesia
**MISC:** Fatigue, epistaxis, night sweats, decreased weight, flulike symptoms, infection
**RESP:** Dyspnea, pulmonary embolism

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Elimination 6 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | Unknown |

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Severe bleeding: Assess for GI bleeding, intracranial bleeding, and pulmonary hemorrhage/hemoptysis; may be fatal; monitor patients for signs and symptoms of bleeding

**BLACK BOX WARNING:** GI perforation: some cases are fatal; monitor patients for signs and symptoms of GI perforation; discontinue therapy if GI perforation develops

• **Poor wound healing:** hold ≥4 wk before elective surgery; after major surgery, do not restart for ≥4 wk and until the surgical wound is entirely healed

• **Severe hypertension/hypertensive crisis:** usually occurs within the first 2 cycles (grade 3 or 4 hypertension); monitor B/P every 2 wk or more often if needed; treatment with antihypertensives may be needed; product may need to be discontinued

• **Severe proteinuria/nephrotic syndrome/thrombotic microangiopathy (TMA):** monitor urine protein by dipstick analysis and urinary protein–to–creatinine ratio (UPCR); obtain a 24-hr urine collection for a UPCR >1; for proteinuria of <2 g/24 hr, temporarily hold doses until proteinuria is <2 g/24 hr; if proteinuria recurs, hold doses until proteinuria is <2 g/24 hr, then permanently reduce; discontinue in nephrotic syndrome or TMA

- **Febrile neutropenia, neutropenic infection/sepsis:** monitor CBC with differential at baseline and before each cycle, hold FOLFIRI until the neutrophil count is ≥1.5 × $10^9$/L
- **Geriatric toxicity:** assess for diarrhea, dizziness, asthenia, weight loss, and dehydration that can indicate toxicity
- **Pregnancy Breastfeeding:** highly effective contraception during treatment and up to 3 mo after the last dose is needed for all patients of reproductive potential because infertility and male-mediated teratogenicity can occur; infertility can occur but is reversible within 18 wk after stopping product: do not breastfeed

### Patient/family education

- **Pregnancy C/breastfeeding:** teach that highly effective contraception should be used during treatment and up to 3 mo after the last dose in all patients of reproductive potential, infertility and male-mediated teratogenicity can occur; infertility is reversible within 18 wk after stopping product; do not breastfeed
- Teach patient about reason for treatment, expected results

**BLACK BOX WARNING:** Notify prescriber immediately of bleeding, severe abdominal pain, poor wound healing

### Evaluation

**Positive therapeutic outcome**

- Decrease in spread of size of tumor

## zoledronic acid (Rx)

(zoh'leh-drah'nick ass'id)

**Reclast, Zometa**

*Func. class.:* Bone-resorption inhibitor

*Chem. class.:* Bisphosphonate

**ACTION:** Inhibits normal and abnormal bone resorption; potent inhibitor of osteoclastic bone resorption; inhibits osteoclastic activity, reduces bone resorption and inhibits skeletal calcium release caused by stimulating factors released by tumors; reduction of abnormal bone resorption is responsible for therapeutic effect in hypercalcemia; may directly block dissolution of hydroxyapatite bone crystals

**Therapeutic outcome:** Serum calcium at normal level

**USES:** Moderate to severe hypercalcemia associated with malignancy; multiple myeloma; bone metastases from solid tumors (used with antineoplastics), active Paget's disease, osteoporosis, glucocorticoid-induced osteoporosis, osteoporosis prophylaxis in postmenopausal women

## CONTRAINDICATIONS

Pregnancy, breastfeeding, hypocalcemia, hypersensitivity to this product or bisphosphonates

**Precautions:** Children, geriatric, renal dysfunction, asthmatic patients, asthma, acute bronchospasm, anemia, chemotherapy, coagulopathy, dehydration, dental disease, diabetes mellitus, renal disease, electrolyte imbalance, hypertension, hypovolemia, phosphate hypersensitivity, infection, multiple myeloma

## DOSAGE AND ROUTES

### Hypercalcemia of malignancy

**Adult: IV** INF 4 mg, given as a single INF over ≥15 min, may re-treat with 4 mg if serum calcium does not return to normal within 1 wk

### Multiple myeloma/metastatic bone lesions

**Adult: IV** INF 4 mg, given over 15 min q3-4wk

### Osteoporosis

**Adult: IV** 5 mg over 15 min or more q12mo

### Active Paget's disease

**Adult: IV** INF 5 mg over ≥15 min

### Osteoporosis prophylaxis (Reclast), postmenopausal women

**Adult: IV** INF 5 mg every other yr

### Osteoporosis prophylaxis (Reclast) taking systemic glucocorticoids

**Adult: IV** 5 mg qyr

### Renal dose

**Adult:** IV INF CCr 50-60 ml/min 3.5 mg; CCr 40-49 ml/min 3.3 mg; CCR 30-39 ml/min 3 mg; CCr <30 ml/min don't use

### Early breast cancer (unlabeled)

**Adult: IV** 4 mg q6mo with goserelin 3.6 mg subcut qmo and tamoxifen 20 mg/day or anastrozole 1 mg/day for 3 yr

**Available forms:** Sol for inj 4 mg/5 ml (Zometa); inj 5 mg/100 ml (Reclast)

### Implementation

- Give acetaminophen before and for 72 hr after to decrease pain
- Sol reconstituted with sterile water may be stored under refrigeration for up to 24 hr **IV**
- Administer in separate **IV** line from all other products

**Zometa**
• Administer after reconstituting by adding 5 ml of sterile water for inj to each vial, then add up to ≥100 ml of sterile 0.9% NaCl, $D_5W$, run over ≥15 min
**Reclast**
• No further dilution required; inf over ≥15 min at constant rate; max 5 mg

## ADVERSE EFFECTS

**CNS:** Dizziness, headache, anxiety, confusion, insomnia, agitation
**CV:** Hypotension, leg edema, atrial fibrillation, chest pain
**GI:** Abdominal pain, anorexia, constipation, nausea, diarrhea, vomiting, taste change
**GU:** UTI, possible reduced renal function, renal damage
**META:** Anemia, hypokalemia, hypomagnesemia, hypophosphatemia, hypocalcemia, increased serum creatinine
**MISC:** *Fever, chills, flulike symptoms*
**MS:** Severe bone pain, *arthralgias, myalgias,* osteonecrosis of the jaw

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly cleared from circulation |
| **Distribution** | Taken up mainly by bones; plasma protein binding ~22% |
| **Metabolism** | Not metabolized |
| **Excretion** | Kidneys (~50% eliminated in urine within 24 hr) |
| **Half-life** | Terminal 167 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 15 min |
| **Duration** | Max effect 7 days |

## INTERACTIONS

### Individual drugs

Calcium, vitamin D: decreased zoledronic acid effect
Digoxin: hypomagnesemia, hypokalemia

### Drug classifications

Aminoglycosides, NSAIDs, radiopaque contrast agents: increased neurotoxicity
Aminoglycosides, loop diuretics: decreased serum calcium
Infusion solutions (calcium-containing): do not mix with calcium-containing inf sol such as lactated Ringer's sol

### Drug/lab test

Increased: creatinine
Decreased: calcium, phosphorus, magnesium, potassium, Hct/Hgb, RBC, platelets, WBC

## NURSING CONSIDERATIONS

### Assessment

• Assess renal function tests and calcium, phosphate, magnesium, potassium, creatinine; if creatinine is elevated hold treatment
• **Assess for hypocalcemia:** paresthesia, twitching, laryngospasm; Chvostek's/Trousseau's signs
• **Assess dental status;** dental health may be required before starting this product, assess mouth for sores, dental cavities, gingivitis, a dental professional exam should be done; cover with antiinfectives for dental extraction
• Assess for atrial fibrillation
• **Pregnancy/breastfeeding:** Not to use in pregnancy, breastfeeding
• **Fluid volume status:** Encourage additional fluid intake or give bolus before use
• **Skeletal survey:** Bone fractures may occur, prevent falls and injury

### Patient/family education

• Instruct patient to report hypercalcemic relapse: nausea, vomiting, bone pain, thirst
• Advise patient to continue with dietary recommendations including calcium and vit D; take a multiple vitamin daily, 500 mg of calcium, 400 international units vit D in multiple myeloma
• Teach patient if nausea/vomiting occur, eat small meals, use lozenges or chewing gum
• Advise patient if bone pain occurs, notify prescriber to obtain analgesic
• Advise patient not to use during pregnancy
• Instruct patient to continue good oral hygiene
• Teach patient that oral health may be required before starting product in high-risk patients, repair of dental cavities, treatment of gingivitis
• Advise patient to report ocular infection or eye pain immediately
• Teach patient that musculoskeletal pain and weakness may occur
• Advise patient to have regular checkups, report mouth sores or jaw pain (osteoporosis of the jaw)

### Evaluation

**Positive therapeutic outcome**
• Calcium levels decreased to normal

## TREATMENT OF OVERDOSE:

Correct clinically relevant reductions in serum calcium by administering **IV** calcium gluconate; in serum phosphorus, with potassium or sodium phosphate; in serum magnesium, with magnesium sulfate

Z

## ZOLMitriptan (Rx)

(zole-mih-trip′tan)
**Zomig, Zomig-ZMT**
*Func. class.:* Migraine agent, abortive
*Chem. class.:* $5HT_{1B}/5HT_{1D}$ receptor agonist (triptan)

**ACTION:** Binds selectively to the vascular serotonin type 1 ($5HT_{1B}/5HT_{1D}$) receptor subtype, exerts antimigraine effect; causes vasoconstriction in cranial arteries

**Therapeutic outcome:** Decreased severity, frequency of headache

**USES:** Acute treatment of migraine with or without aura

## CONTRAINDICATIONS

Angina pectoris, history of MI, documented silent ischemia, ischemic heart disease, uncontrolled hypertension, hypersensitivity, basilar or hemiplegic migraine, risk of CV events

**Precautions:** Pregnancy, breastfeeding, children, postmenopausal women, men >40 yr, geriatric, risk factors for CAD, hypercholesterolemia, obesity, diabetes, impaired renal/hepatic function

## DOSAGE AND ROUTES

**Adult:** PO start at 2.5 mg or lower (tab may be broken), may repeat after 2 hr, max 10 mg/24 hr; NASAL 1 spray in 1 nostril at onset of migraine, repeat in 2 hr if no relief

**Available forms:** Tabs 2.5, 5 mg; orally disintegrating tabs 2.5, 5 mg; nasal spray 2.5, 5 mg

### Implementation

- Give with fluids as soon as symptoms of migraine occur
- Provide quiet, calm environment with decreased stimulation for noise, bright light, excessive talking

**Orally disintegrating tablet**

- Give orally disintegrating tablet after opening; do not crush or chew, allow to dissolve on tongue

## ADVERSE EFFECTS

**CNS:** *Tingling, hot sensation, burning, feeling of pressure, tightness, numbness, dizziness, sedation*
**CV:** Palpitations, chest pain
**GI:** Abdominal discomfort, nausea, dry mouth, dyspepsia, dysphagia
**MISC:** Odd taste (spray)
**MS:** *Weakness, neck stiffness,* myalgia
**RESP:** Chest tightness, pressure

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | 25% plasma protein binding |
| **Metabolism** | Liver |
| **Excretion** | Urine, feces |
| **Half-life** | 3-3½ hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | Unknown |
| **Duration** | 2-3½ hr |

## INTERACTIONS

### Individual drugs

Cimetidine: increased half-life of ZOLMitriptan
Ergot: increased vasospastic effects
FLUoxetine, fluvoxaMINE, PARoxetine, sertraline: increased weakness, hyperreflexia, incoordination
Sibutramine: increased ZOLMitriptan levels

### Drug classifications

Contraceptives (oral): increased half-life of ZOLMitriptan
Ergot derivatives: increased vasospastic effects
MAOIs: do not use within 2 wk
Selective serotonin reuptake inhibitors: increased weakness, hyperreflexia, incoordination

### Drug/herb

SAM-e, St. John's wort: serotonin syndrome

### Drug/lab test

Increased: alkaline phosphatase

## NURSING CONSIDERATIONS

### Assessment

- Assess for tingling, hot sensation, burning, feeling of pressure, numbness, flushing
- Assess neurologic status: LOC, blurring vision, nausea, vomiting, tingling in extremities preceding headache
- Monitor ingestion of tyramine foods (pickled products, beer, wine, aged cheese), food additives, preservatives, colorings, artificial sweeteners, chocolate, caffeine, which may precipitate these types of headaches
- Assess for serotonin syndrome if also taking an SSRI
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, may cause fetal harm and death, do not breastfeed, excreted in breast milk
- **Beers:** Avoid use in older adults, may cause CNS effects

### Patient/family education

- Teach patient to report any side effects to prescriber

• Advise patient to use contraception while taking product
• Teach patient to report pain, rash, swelling of face
• Instruct patient not to double doses; if second dose is needed, wait at least 2 hr; disintegrating dosage form: do not split, break, alter, to remove from blister pack immediately before use
• Teach patient that product does not reduce or prevent number of migraines and not to use for other headaches

### Evaluation

**Positive therapeutic outcome**
• Decrease in frequency, severity of headache

**⚠ HIGH ALERT**

## zolpidem (Rx)

(zole-pi′dem)
**Ambien, Ambien CR, Edluar, Intermezzo, Zolpimist**
*Func. class.:* Sedative-hypnotic
*Chem. class.:* Nonbenzodiazepine of imidazopyridine class
**Controlled substance schedule IV**

**ACTION:** Produces CNS depression at limbic, thalamic, hypothalamic levels of CNS; may be mediated by neurotransmitter γ-aminobutyric acid (GABA); results are sedation, hypnosis, skeletal muscle relaxation, anticonvulsant activity, anxiolytic action

**Therapeutic outcome:** Ability to sleep, sedation

**USES:** Insomnia, short-term treatment; insomnia with difficulty of sleep onset/maintenance (ext rel)

## CONTRAINDICATIONS

Hypersensitivity to benzodiazepines

**Precautions:** Pregnancy, breastfeeding, children <18 yr, geriatric, anemia, hepatic disease, suicidal individuals, product abuse, seizure disorders, angioedema, depression, respiratory disease, sleep apnea, sleep-related behavior (sleep walking), myasthenia gravis, pulmonary disease, next-morning impairments; females (lower dose needed)

## DOSAGE AND ROUTES

**Adult:** PO 10 mg at bedtime × 7-10 days only; total dose max 10 mg; EXT REL 12.5 mg immediately before bedtime, may be useful for up to 24 wk in people 18-64 yr with primary insomnia; oral spray (Zolpimist) 10 mg (2 sprays) immediately before bedtime, max 10 mg/day; SL (Edluar) 10 mg just before bedtime
**Geriatric:** PO 5 mg at bedtime; EXT REL 6.25 mg

**Available forms:** Tabs 5, 10 mg; ext rel tabs 6.25, 12.5 mg; SL 1.75, 3.5, 5, 10 mg; oral spray 5 mg/spray

### Implementation

**PO route**
• Do not break, crush, or chew ext rel product or orally disintegrating tab
• Give ½-1 hr before bedtime for sleeplessness; give several hr before patient is to rise (to avoid hangover)
• Give with food or fluids; tab may be crushed or swallowed whole
• Do not use spray with or after a meal
• Store in airtight container in cool environment

## ADVERSE EFFECTS

**CNS:** Headache, lethargy, drowsiness, daytime sedation, dizziness, confusion, light-headedness, anxiety, irritability, amnesia, poor coordination, complex sleep-related reactions (sleep driving, sleep eating), depression, somnolence, suicidal ideation, abnormal thinking/behavioral changes
**CV:** Chest pain, palpitation
**GI:** Nausea, vomiting, diarrhea, heartburn, abdominal pain, constipation
**HEMA:** Leukopenia, granulocytopenia (rare)
**MISC:** Myalgia
**SYST:** Severe allergic reactions, angioedema, anaphylaxis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Rapidly absorbed |
| **Distribution** | Unknown |
| **Metabolism** | Liver—inactive metabolite |
| **Excretion** | Kidneys, breast milk |
| **Half-life** | 2½ hr, increased in geriatric |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | PO up to 1.5 mg |

## INTERACTIONS

### Individual drugs

Alcohol: increased action of both products

### Drug classifications

CNS depressants: increased action of both products
CYP3A4 inhibitors/inducers: increased or decreased zolpidem levels

Z

## NURSING CONSIDERATIONS

### Assessment

- Assess mental status: mood, sensorium, anxiety, affect, sleeping pattern, drowsiness, dizziness, especially geriatric; physical dependency, withdrawal symptoms: anxiety, panic attacks, agitation, seizures, headache, nausea, vomiting, muscle pain, weakness; suicidal tendencies; for indications of increasing tolerance and abuse
- Monitor B/P (lying, standing), pulse; if systolic B/P drops 20 mm Hg, hold product, notify prescriber
- Monitor I&O ratio for renal dysfunction
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, may cause fetal harm, cautious use in breastfeeding
- **Beers:** Avoid in older adults, CNS effects occur

### Patient/family education

- Advise patient that complex sleep-related behavior may occur (sleep driving/eating)
- Instruct patient that product may be taken with food or fluids, next-morning impairment may occur
- Caution patient not to use for everyday stress or longer than 3 mo unless directed by prescriber; not to take more than prescribed amount; may be habit forming; not to double or skip doses
- Caution patient to avoid OTC preparations unless approved by prescriber; alcohol and CNS depressants will increase CNS depression
- Advise patient to avoid driving, activities that require alertness, because drowsiness may occur; to avoid alcohol ingestion or other psychotropic medications; to rise slowly or fainting may occur, especially geriatric; that drowsiness may worsen at beginning of treatment
- Instruct patient not to discontinue medication abruptly after long-term use; withdrawal symptoms include vomiting, cramping, tremors, seizures
- Teach patient use of orally disintegrating tabs: place on tongue, allow to dissolve before swallowing
- Teach patient not to crush, chew, break ext rel tabs
- Teach patient to prime spray pump before using

### Evaluation

**Positive therapeutic outcome**

- Ability to sleep at night
- Decreased amount of early-morning awakening if taking product for insomnia

## TREATMENT OF OVERDOSE:

Lavage, VS, supportive care

## zonisamide (Rx)

(zone-is'a-mide)

**Zonegran**

*Func. class.:* Anticonvulsant

*Chem. class.:* Sulfonamides

**ACTION:** May act through sodium and calcium channels, but exact action is unknown; serotoninergic action

**Therapeutic outcome:** Decreased seizures

**USES:** Adjunctive therapy of partial seizures

## CONTRAINDICATIONS

Hypersensitivity to this product or sulfonamides

**Precautions:** Pregnancy, breastfeeding, children <16 yr, geriatric, allergies, renal/hepatic disease, psychiatric condition, hepatic failure, pulmonary disease, suicidal ideation

## DOSAGE AND ROUTES

**Adults and child >16 yr:** PO 100 mg/day, may increase after 2 wk to 200 mg/day, may increase q2wk, max dose 600 mg/day

**Available forms:** Caps 25, 50, 100 mg

### Implementation

- Give without regard to food, swallow whole

## ADVERSE EFFECTS

**CNS:** Dizziness, insomnia, paresthesias, depression, fatigue, headache, confusion, somnolence, agitation, irritability, speech disturbance, suicidal ideation, seizures, status epilepticus
**EENT:** Diplopia, verbal difficulty, speech abnormalities, taste perversion, amblyopia, pharyngitis, rhinitis, tinnitus, nystagmus
**GI:** Nausea, constipation, anorexia, weight loss, diarrhea, dyspepsia, dry mouth, abdominal pain
**GU:** Kidney stones
**HEMA:** Aplastic anemia, granulocytopenia (rare), ecchymosis
**INTEG:** Rash
**MISC:** Flulike symptoms
**SYST:** Stevens-Johnson syndrome, metabolic acidosis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 40% |
| **Metabolism** | Liver |
| **Excretion** | Kidneys |
| **Half-life** | In RBCs 105 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-6 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Individual drugs

Alcohol: increased CNS depression

### Drug classifications

CarBAMazepine, PHENobarbital, phenytoin: decreased half-life of zonisamide

CYP3A4 inducers, inhibitors: altered product levels

### Drug/herb

St. John's wort: increased effect of zonisamide

### Drug/food

Grapefruit: do not use together

### Drug/lab test

Increased: BUN, creatinine

## NURSING CONSIDERATIONS

### Assessment

- Assess for seizures: duration, type, intensity, precipitating factors
- Renal function: albumin conc, BUN, urinalysis, creatinine; serum bicarbonate baseline, periodically
- **Assess mental status:** mood, sensorium, affect, memory (long, short); suicidal thoughts/behavior
- Stevens-Johnson syndrome, aplastic anemia, fulminant hepatic necrosis; may cause death; monitor for rashes and hypersensitive reactions
- Assess for rash, hypersensitivity reaction
- Obtain bicarbonate before treatment/periodically; metabolic acidosis may occur in child
- **Pregnancy/breastfeeding:** Use only if benefits outweigh fetal risk, may cause fetal harm, pregnant patients should enroll in the North American Antiepileptic Drug Pregnancy Registry 888-233-2334, do not breastfeed, excreted in breast milk

### Patient/family education

- Advise patient not to discontinue product abruptly; seizures may occur
- Advise patient to avoid hazardous activities until stabilized on product
- Advise patient to carry/wear emergency ID stating product use
- Teach patient not to use grapefruit juice
- Teach patient to notify prescriber of sore throat, fever, easy bruising
- Teach patient to notify prescriber of rash immediately; to notify prescriber of back pain, abdominal pain, blood in urine; to increase fluid intake to reduce risk of kidney stones
- Teach patient to report suicidal thoughts, behaviors immediately
- **Beers:** Avoid in older adults unless safer alternative is not available, may cause ataxia, impaired psychomotor function

### Evaluation

#### Positive therapeutic outcome

- Decrease in severity of seizures

zafirlukast (Rx)
zidovudine (Rx)
ziv-aflibercept
zolpidem (Rx)
zaleplon (Rx)
zinc (PO, OTC; IV, Rx)
zoledronic acid (Rx)
zonisamide (Rx)
zanamivir (Rx)
ziprasidone (Rx)
ZOLMitriptan (Rx)

## Alpha-adrenergic Blockers

**ACTION:** α-Adrenergic blockers bind to α-adrenergic receptors, causing dilatation of peripheral blood vessels and lower peripheral resistance resulting in decreased blood pressure.

**USES:** α-Adrenergic blockers are used for benign prostatic hyperplasia, pheochromocytoma, prevention of tissue necrosis, and sloughing associated with extravasation of IV vasopressors.

### CONTRAINDICATIONS

Hypersensitive reactions may occur, and allergies should be identified before these products are given. Patients with myocardial infarction, coronary insufficiency, angina, or other evidence of coronary artery disease should not use these products.

### IMPLEMENTATION

**PO route**

- Start with low dose, gradually increasing to prevent side effects
- Give with food or milk for GI symptoms

**ADVERSE EFFECTS:** The most common side effects are hypotension, tachycardia, nasal stuffiness, nausea, vomiting, and diarrhea.

**PHARMACOKINETICS:** Onset, peak, and duration vary among products.

**INTERACTIONS:** Vasoconstrictive and hypertensive effects of EPINEPHrine are antagonized by α-adrenergic blockers.

### NURSING CONSIDERATIONS

#### Assessment

- Monitor electrolytes: potassium, sodium chloride, carbon dioxide
- Monitor weight daily, I&O
- Monitor B/P with patient lying, standing before starting treatment, q4hr thereafter
- Assess for nausea, vomiting, diarrhea
- Assess for skin turgor, dryness of mucous membranes for hydration status

#### Patient/family education

- Caution patient to avoid alcoholic beverages
- Advise patient to report dizziness, palpitations, fainting
- Instruct patient to change position slowly or fainting may occur
- Teach patient to take product exactly as prescribed; to avoid all OTC products (cough, cold, allergy) unless directed by prescriber

#### Evaluation

**Positive therapeutic outcome**

- Decreased B/P
- Increased peripheral pulses

### Generic Names

*α 1 blockers:*
silodosin

## Anesthetics—general/local

**ACTION:** Anesthetics (general) act on the CNS to produce tranquilization and sleep before invasive procedures. Anesthetics (local) inhibit conduction of nerve impulses from sensory nerves.

**USES:** General anesthetics are used to premedicate for surgery, and for induction and maintenance in general anesthesia. For local anesthetics, refer to individual product listing for indications.

### CONTRAINDICATIONS

Persons with CVA, increased ICP, severe hypertension, and cardiac decompensation should not use these products since severe adverse reactions can occur.

**Precautions:** Anesthetics (general) should be used with caution in the geriatric, children <2 yr, and those with cardiovascular disease (hypotension, bradydysrhythmias), renal/hepatic disease, and Parkinson's disease. The precaution for anesthetics (local) is pregnancy.

### IMPLEMENTATION

- Give anticholinergic preoperatively to decrease secretions
- Administer only with resuscitative equipment nearby
- Provide quiet environment for recovery to decrease psychotic symptoms

**ADVERSE EFFECTS:** The most common side effects are dystonia, akathisia, flexion of arms, fine tremors, drowsiness, restlessness, and hypotension. Also common are chills, respiratory depression, and laryngospasm.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver and excreted in urine.

**INTERACTIONS:** AOIs, tricyclics, and phenothiazines may cause severe hypo/hypertension when used with local anesthetics. CNS depressants will potentiate general and local anesthetics.

## NURSING CONSIDERATIONS

### Assessment

- Monitor VS q10min during **IV** administration, q30min after IM dose

### Evaluation

**Positive therapeutic outcome**

- Maintenance of anesthesia
- Decreased pain

### Generic Names

*General anesthetics:*
**droperidol** (high alert), **fentaNYL** (high alert), fentaNYL/droperidol, fentaNYL transdermal, fospropofol, midazolam, **propofol** (high alert)

*Local anesthetics:*
**lidocaine, parenteral** (high alert), penicillin G procaine, ropivacaine

## Antacids

**ACTION:** Antacids are basic compounds that neutralize gastric acidity and decrease the rate of gastric emptying. Products are divided into those containing aluminum, magnesium, calcium, or a combination of these.

**USES:** Antacids decrease hyperacidity in conditions such as peptic ulcer disease, reflux esophagitis, gastritis, or hiatal hernia.

## CONTRAINDICATIONS

Sensitivity to aluminum or magnesium products may cause hypersensitive reactions. Aluminum products should not be used by persons sensitive to aluminum. Magnesium products should not be used by persons sensitive to magnesium. Check for sensitivity before administering.

**Precautions:** Magnesium products should be given cautiously to patients with renal insufficiency, and during pregnancy and breastfeeding. Sodium content of antacids may be significant. Use with caution for patients with hypertension, or HF or those on a low-sodium diet.

## IMPLEMENTATION

- Advise patient not to take other products within 1-2 hr of antacid administration, since antacids may impair absorption of other products
- Give all products with an 8-oz glass of water to ensure absorption in the stomach
- Give another antacid if constipation occurs with aluminum products

**ADVERSE EFFECTS:** The most common side effect caused by aluminum-containing antacids is constipation, which may lead to fecal impaction and bowel obstruction. Diarrhea occurs often when magnesium products are given. Alkalosis may occur when systemic products are used. Constipation occurs more frequently than laxation with calcium carbonate. The release of $CO_2$ from carbonate-containing antacids causes belching, abdominal distention, and flatulence. Sodium bicarbonate may act as a systemic antacid and produce systemic electrolyte disturbances and alkalosis. Calcium carbonate and sodium bicarbonate may cause rebound hyperacidity and milk-alkali syndrome. Alkaluria may occur when products are used on a long-term basis, particularly in persons with abnormal renal function.

**PHARMACOKINETICS:** Duration is 20-40 min. If ingested 1 hr after meals, acidity is reduced for at least 3hr.

**INTERACTIONS:** Products whose effects may be increased by some antacids include quiNIDine, amphetamines, pseudoephedrine, levodopa, valproic acid, and dicumarol. Products whose effects may be decreased by some antacids include cimetidine, corticosteroids, ranitidine, iron salts, phenothiazines, phenytoin, digoxin, tetracyclines, ketoconazole, salicylates, and isoniazid.

## NURSING CONSIDERATIONS

### Assessment

- Assess for aggravating and alleviating factors of epigastric pain or hyperacidity; identify the location, duration, and characteristics of epigastric pain
- Assess GI symptoms, including constipation, diarrhea, abdominal pain; if severe abdominal pain with fever occurs, these products should not be given
- Assess renal symptoms, including increasing urinary pH, electrolytes

### Evaluation

**Positive therapeutic outcome**

- Absence of epigastric pain
- Decreased acidity

### Generic Names

aluminum hydroxide, bismuth subsalicylate, calcium carbonate, magaldrate, magnesium oxide, sodium bicarbonate

## Anti-Alzheimer Agents

**ACTION:** Anti-Alzheimer agents improve cognitive functioning by increasing acetylcholine

and inhibiting cholinesterase in the CNS. They do not cure the condition, but improve symptoms.

**USES:** Anti-Alzheimer agents are used for the treatment of Alzheimer's symptoms.

## CONTRAINDICATIONS

Persons with hypersensitivity reactions should not use these products.

**Precautions:** Anti-Alzheimer agents should be used cautiously in pregnancy, breastfeeding, sick sinus syndrome, GI bleeding, bladder obstruction, and seizures.

## IMPLEMENTATION

- Give lowest possible dose for therapeutic result; adjust dose to response
- Provide assistance with ambulation during beginning therapy if dizziness, ataxia occur

**ADVERSE EFFECTS:** The most common side effects are nausea, vomiting, diarrhea, dry mouth, insomnia, dizziness, urinary frequency, incontinence, and rash. The most serious side effects are seizures and dysrhythmias.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver and excreted by the kidneys.

**INTERACTIONS:** Increased synergistic reactions may occur with succinylcholine, cholinesterase inhibitors, and cholinergic agonists. There may be a decrease in the action of anticholinergics, and there may be additive effects when used with cholinergic agents.

## NURSING CONSIDERATIONS

### Assessment

- B/P, hypo/hypertension
- Mental status: affect, mood, behavioral changes, depression, confusion
- GI status: nausea, vomiting, anorexia, diarrhea
- GU status: urinary frequency, incontinence

### Patient/family education

- Instruct patient to report side effects, adverse reactions to healthcare provider
- Advise patient to use exactly as prescribed, at regular intervals
- Caution patient not to increase or abruptly decrease dose; serious consequences may result
- Inform patient that product is not a cure, but relieves symptoms

### Evaluation

#### Positive therapeutic outcome

- Decrease in confusion
- Improved mood

**Generic Names**
donepezil, memantine, rivastigmine

# Antianginals

**ACTION:** Antianginals are divided into the nitrates, calcium channel blockers, and β-adrenergic blockers. The nitrates dilate coronary arteries, causing decreased preload, and dilate systemic arteries, causing decreased afterload. Calcium channel blockers dilate coronary arteries and decrease SA/AV node conduction. β-adrenergic blockers decrease heart rate so that myocardial $O_2$ use is decreased. Dipyridamole selectively dilates coronary arteries to increase coronary blood flow.

**USES:** Antianginals are used in chronic stable angina pectoris, unstable angina, and vasospastic angina. Some (i.e., calcium channel blockers and β-blockers) may be used as dysrhythmics and in hypertension.

## CONTRAINDICATIONS

Persons with known hypersensitivity, increased ICP, or cerebral hemorrhage should not use some of these products.

**Precautions:** Antianginals should be used with caution in pregnancy, breastfeeding, children, postural hypotension, renal disease, and hepatic injury.

## IMPLEMENTATION

- Store protected from light, moisture; place in cool environment

**ADVERSE EFFECTS:** The most common side effects are postural hypotension, headache, flushing, dizziness, nausea, edema, and drowsiness. Also common are rash, dysrhythmias, and fatigue.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among coronary products. Most products are metabolized in the liver and excreted in urine.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

## NURSING CONSIDERATIONS

### Assessment

- Monitor orthostatic B/P, pulse
- Assess for pain: duration, time started, activity being performed, character
- Assess for tolerance if taken over long period
- Assess for headache, light-headedness, decreased B/P; may indicate a need for decreased dosage

### Patient/family education

- Instruct patient to keep tabs in original container
- Instruct patient not to use OTC products unless directed by prescriber
- Advise patient to report bradycardia, dizziness, confusion, depression, fever
- Teach patient to take pulse at home; advise when to notify prescriber
- Advise patient to avoid alcohol, smoking, sodium intake
- Advise patient to comply with weight control, dietary adjustments, modified exercise program
- Teach patient to carry/wear emergency ID to identify product being taken, allergies
- Caution patient to make position changes slowly to prevent fainting

### Evaluation

**Positive therapeutic outcome**

- Decrease, prevention of anginal pain

### Generic Names

*Nitrates:*
isosorbide, nitroglycerin

*β-adrenergic blockers:*
atenolol, dipyridamole, metoprolol, nadolol, propranolol

*Calcium channel blockers:*
amLODIPine, **diltiazem** (high alert), niCARdipine, NIFEdipine, verapamil

*Miscellaneous:*
ranolazine

## Antianxiety Agents

**ACTION:** Benzodiazepines potentiate the action of GABA, including any other inhibitory transmitters in the CNS, resulting in decreased anxiety. Most agents cause a decrease in CNS excitability.

**USES:** Anxiety is relieved in conditions such as generalized anxiety disorder and phobic disorders. Benzodiazepines are also used for acute alcohol withdrawal to prevent delirium tremens, and some products are used for relaxation before surgery.

### CONTRAINDICATIONS

These products are contraindicated in hypersensitivity, acute closed-angle glaucoma, breastfeeding (diazepam), children <6 mo, and hepatic disease (clonazePAM).

**Precautions:** Antianxiety agents should be used cautiously in geriatric or debilitated patients. Usually smaller doses are needed since metabolism is slowed. Persons with renal/hepatic disease may show delayed excretion. ClonazePAM may increase the incidence of seizures.

### IMPLEMENTATION

- Give with food or milk for GI symptoms; may give crushed if patient is unable to swallow whole (tabs only, no controlled or sustained-release products)

**ADVERSE EFFECTS:** The most common side effects are dizziness, drowsiness, blurred vision, and orthostatic hypotension. Most adverse reactions are mediated through the CNS. There is potential for abuse and physical dependence with some products.

**PHARMACOKINETICS:** Most of these agents are metabolized by the liver and excreted via the kidneys.

**INTERACTIONS:** Increased CNS depression may occur when given with other CNS depressants. These products should be used together cautiously. Alcohol should not be used, as fatal reactions have occurred. The serum concentration and toxicity may be increased when used with benzodiazepines.

### NURSING CONSIDERATIONS

#### Assessment

- Assess B/P (lying and standing), pulse; if systolic B/P drops 20 mm Hg, hold product and notify prescriber; orthostatic hypotension can be severe
- Monitor renal/hepatic function tests: AST, ALT, bilirubin, creatinine, LDH, alkaline phosphatase
- Monitor physical dependency and withdrawal with some products, including headache, nausea, vomiting, muscle pain, and weakness after long-term use

#### Patient/family education

- Inform patient that product should not be used for everyday stress or long-term use; not to take more than prescribed amount since product is habit forming
- Caution patient to avoid driving and activities that require alertness since drowsiness and dizziness may occur
- Instruct patient to abstain from alcohol, other psychotropic medications unless directed by prescriber
- Caution patient not to discontinue abruptly; after extended periods, withdrawal symptoms may occur

#### Evaluation

**Positive therapeutic outcome**

- Decreased anxiety
- Increased relaxation

### Generic Names

*Benzodiazepines:*
ALPRAZolam, chlordiazePOXIDE, clonazePAM, diazepam, LORazepam, midazolam, triazolam

*Miscellaneous:*
busPIRone, doxepin, hydrOXYzine, PARoxetine, venlafaxine

## Antiasthmatics

**ACTION:** Bronchodilators are divided into anticholinergics, α/β-adrenergic agonists, β-adrenergic agonists, and phosphodiesterase inhibitors. Also included in antiasthmatic agents are corticosteroids, leukotriene antagonists, mast cell stabilizers, and monoclonal antibodies. Anticholinergics act by inhibiting interaction of acetylcholine at receptor sites on bronchial smooth muscle. α/β-adrenergic agonists act by relaxing bronchial smooth muscle and increasing diameter of nasal passages. β-adrenergic agonists act by action on $\beta_2$-receptors, which relaxes bronchial smooth muscle. Phosphodiesterase inhibitors act by blocking phosphodiesterase and increasing cAMP, which mediates smooth muscle relaxation in the respiratory system. Corticosteroids act by decreasing inflammation in the bronchial system. Leukotriene receptor antagonists decrease leukotrienes, and mast cell stabilizers decrease histamine; both act to decrease bronchospasm.

**USES:** Antiasthmatics are used for bronchial asthma; bronchospasm associated with bronchitis, emphysema, or other obstructive pulmonary diseases; Cheyne-Stokes respirations; and prevention of exercise-induced asthma. Some products are used for rhinitis and other allergic reactions.

### CONTRAINDICATIONS

Persons with hypersensitivity, closed-angle glaucoma, tachydysrhythmias, and severe cardiac disease should not use some of these products.

**Precautions:** Antiasthmatics should be used with caution in pregnancy, breastfeeding, hyperthyroidism, hypertension, prostatic hypertrophy, and seizure disorders.

### IMPLEMENTATION

- Give inhaled product after shaking; exhale, place mouthpiece in mouth, inhale slowly, hold breath, remove, exhale slowly
- Give PO product with meals to decrease gastric irritation
- Store inhaled product in light-resistant container; do not expose to temperatures >86° F (30° C)
- Give gum, small sips of water for dry mouth

**ADVERSE EFFECTS:** The most common side effects are tremors, anxiety, nausea, vomiting and irritation in the throat. The most serious adverse reactions are bronchospasm and dyspnea.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized by the liver and excreted in urine.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

### NURSING CONSIDERATIONS

#### Assessment

- Monitor respiratory function: vital capacity, forced expiratory volume, ABGs, lung sounds, heart rate and rhythm, aggravating and alleviating factors

#### Patient/family education

- Caution patient to avoid hazardous activities; drowsiness or dizziness may occur with some products
- Instruct patient to obtain bloodwork as required; some products require blood levels to be drawn
- Advise patient to avoid all OTC medications unless approved by provider
- Instruct patient to report side effects, including insomnia, heart palpitations, light-headedness; these side effects may occur with some products

#### Evaluation

**Positive therapeutic outcome**

- Decreased severity and number of asthma attacks
- Absence of dyspnea, wheezing

### Generic Names

*Bronchodilators:*
albuterol, arformoterol, **atropine** (high alert), formoterol, ipratropium, levalbuterol, terbutaline, theophylline, tiotropium

*Adrenergics:*
**EPINEPHrine** (high alert)

*Corticosteroids:*
beclomethasone, betamethasone, budesonide, cortisone, dexamethasone, flunisolide, fluticasone, hydrocortisone, methylPREDNISolone, predniSONE, triamcinolone

*Leukotriene antagonists:*
zafirlukast

*Monoclonal antibodies:*
omalizumab

## Anticholinergics

**ACTION:** Anticholinergics inhibit the muscarinic actions of acetylcholine at receptor sites in the autonomic nervous system. Anticholinergics are also known as antimuscarinic products.

**USES:** Anticholinergics are used for a variety of conditions: decreasing involuntary movements in parkinsonism (benztropine, trihexyphenidyl); bradydysrhythmias (atropine); nausea and vomiting (scopolamine); and as cycloplegic mydriatics (atropine, homatropine, scopalamine, cyclopentolate, tropicamide). Gastrointestinal anticholinergics are used to decrease motility (smooth muscle tone) in the GI, biliary, and urinary tracts and for their ability to decrease gastric secretions (propantheline, glycopyrrolate).

### CONTRAINDICATIONS

Persons with closed-angle glaucoma, myasthenia gravis, or GI/GU obstruction should not use some of these products.

**Precautions:** Anticholinergics should be used with caution in pregnant, breastfeeding, or geriatric patients, or in those with prostatic hypertrophy, HF, or hypertension. Use with caution in the presence of high environmental temperature.

### IMPLEMENTATION

**PO route**

- Give with or after meals to prevent GI upset; may give with fluids other than water
- Store at room temperature
- Give hard candy, frequent drinks, sugarless gum to relieve dry mouth

**IM/IV route**

- Give parenteral dose with patient recumbent to prevent postural hypotension
- Give parenteral dose slowly; keep in bed for at least 1 hr after dose; monitor VS
- Give after checking dose carefully; even slight overdose could lead to toxicity

**ADVERSE EFFECTS:** The most common side effects are dry mouth, constipation, urinary retention, urinary hesitancy, headache, and dizziness. Also common is paralytic ileus.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver and excreted in urine.

**INTERACTIONS:** Increased anticholinergic effects may occur when used with MAOIs, tricyclics, and amantadine. Anticholinergics may cause a decreased effect of phenothiazines and levodopa.

### NURSING CONSIDERATIONS

#### Assessment

- Assess I&O ratio; retention commonly causes decreased urinary output
- Assess for urinary hesitancy, retention; palpate bladder if retention occurs
- Assess for constipation; increase fluids, bulk, exercise if this occurs
- Identify tolerance over long-term therapy; dosage may need to be increased or changed
- Assess mental status: affect, mood, CNS depression, worsening of mental symptoms during early therapy

#### Patient/family education

- Caution patient to avoid driving and other hazardous activities; drowsiness may occur
- Advise patient to avoid OTC medication: cough, cold preparations with alcohol, antihistamines unless directed by prescriber

#### Evaluation

**Positive therapeutic outcome**

- Decreased secretions
- Absence of nausea and vomiting

---

### Generic Names

**atropine** (high alert), benztropine, glycopyrrolate, hyoscyamine, scopolamine (transdermal), solifenacin

## Anticoagulants

**ACTION:** Anticoagulants interfere with blood clotting by preventing clot formation.

**USES:** Anticoagulants are used for DVT, pulmonary emboli, myocardial infarction, open heart surgery, disseminated intravascular clotting syndrome, atrial fibrillation with embolization, and in transfusion and dialysis.

### CONTRAINDICATIONS

Persons with hemophilia and related disorders, leukemia with bleeding, peptic ulcer disease, thrombocytopenic purpura, blood dyscrasias, acute nephritis, and subacute bacterial endocarditis should not use these products.

**Precautions:** Anticoagulants should be used with caution in pregnancy, geriatric, and alcoholism.

### IMPLEMENTATION

- Store in tight container (PO dose)

**SUBCUT route**
- Give at same time each day to maintain steady blood levels
- Do not massage area or aspirate when giving SUBCUT inj; give in abdomen between pelvic bones; rotate sites; do not pull back on plunger, leave in for 10 sec; apply gentle pressure for 1 min
- Do not change needles
- Avoid all IM inj that may cause bleeding

**ADVERSE EFFECTS:** The most serious adverse reactions are hemorrhage, agranulocytosis, leukopenia, eosinophilia, and thrombocytopenia, depending on the specific product. The most common side effects are diarrhea, rash, and fever.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver and excreted in urine.

**INTERACTIONS:** Salicylates, steroids, and nonsteroidal antiinflammatories will potentiate the action of anticoagulants. Anticoagulants may cause serious effects. Check individual monographs for specific information.

## NURSING CONSIDERATIONS

### Assessment
- Monitor blood tests (Hct, platelets, occult blood in stools) q3mo
- Monitor PTT, which should be 1½-2 × control, PPT; daily, APTT, ACT, INR
- Monitor B/P; watch for increasing signs of hypertension
- Monitor for bleeding gums, petechiae, ecchymosis, black tarry stools, hematuria
- Monitor for fever, skin rash, urticaria
- Monitor for needed dosage change q1-2wk

### Patient/family education
- Advise patient to avoid OTC preparations that may cause serious product interactions unless directed by prescriber
- Inform patient that product may be held during active bleeding (menstruation), depending on condition
- Caution patient to use soft-bristle toothbrush to prevent bleeding gums; avoid contact sports; use electric razor
- Instruct patient to carry/wear emergency ID identifying product taken
- Instruct patient to report any signs of bleeding: gums, under skin, urine, stools

### Evaluation

**Positive therapeutic outcome**
- Decrease of DVT

## Generic Names

argatroban, dabigatran, **dalteparin** (high alert), **enoxaparin** (high alert), fondaparinux, **heparin** (high alert), **lepirudin** (high alert), **tinzaparin** (high alert), **warfarin** (high alert)

# Anticonvulsants

**ACTION:** Anticonvulsants are divided into the barbiturates, benzodiazepines, hydantoins, succinimides, and miscellaneous products. Barbiturates and benzodiazepines are discussed in separate sections. Hydantoins act by inhibiting the spread of seizure activity in the motor cortex. Succinimides act by inhibiting spike and wave formation; they also decrease amplitude, frequency, duration, and spread of discharge in seizures.

**USES:** Hydantoins are used in generalized tonic-clonic seizures, status epilepticus, and psychomotor seizures. Succinimides are used for absence (or petit mal) seizures. Barbiturates are used in generalized tonic-clonic and cortical focal seizures.

## CONTRAINDICATIONS

Hypersensitive reactions may occur, and allergies should be identified before these products are given.

**Precautions:** Persons with renal/hepatic disease should be watched closely.

## IMPLEMENTATION

**PO route**
- Give with food, milk to decrease GI symptoms
- Provide good oral hygiene as it is important for patients taking hydantoins

**ADVERSE EFFECTS:** Bone marrow depression is the most life-threatening adverse reaction associated with hydantoins or succinimides. The most common side effects are GI symptoms. Other common side effects for hydantoins are gingival hyperplasia and CNS effects such as nystagmus, ataxia, slurred speech, and confusion.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver and excreted in urine, bile, and feces.

**INTERACTIONS:** Hydantoins cause decreased effects of estrogens, and oral contraceptives.

## NURSING CONSIDERATIONS

### Assessment
- Monitor renal function tests, including BUN, creatinine, serum uric acid, urine CCr before, during therapy

• Monitor blood tests: RBC, Hct, Hgb, reticulocyte counts weekly for 4 wk then monthly
• Monitor hepatic function tests: AST, ALT, bilirubin, creatinine
• Assess mental status, including mood, sensorium, affect, behavioral changes; if mental status changes, notify prescriber
• Assess for eye problems, including need for ophth examinations before, during, and after treatment (slit lamp, fundoscopy, tonometry)
• Assess for allergic reaction, including red, raised rash; if this occurs, product should be discontinued
• Assess for blood dyscrasias, including fever, sore throat, bruising, rash, jaundice
• Monitor toxicity, including bone marrow depression, nausea, vomiting, ataxia, diplopia, cardiovascular collapse, Stevens-Johnson syndrome

### Patient/family education

• Advise patient to carry/wear emergency ID stating products taken, condition, prescriber's name, phone number
• Advise patient to avoid driving, other activities that require alertness

### Evaluation

**Positive therapeutic outcome**

• Decreased seizure activity; document on patient's chart

### Generic Names

*Succinimides:*
ethosuximide

*Hydantoins:*
fosphenytoin, phenytoin

*Miscellaneous:*
acetaZOLAMIDE, carBAMazepine, clonazePAM, diazepam, eslicarbazepine, ezogabine, gabapentin, lacosamide, lamoTRIgine, **magnesium sulfate** (high alert), rufinamide, tiaGABine, topiramate, valproate/valproic acid/divalproex sodium, vigabatrin, zonisamide

*Barbiturates:*
**PHENobarbital** (high alert), primidone, **thiopental** (high alert)

## Antidepressants

**ACTION:** Antidepressants are divided into the tricyclics, MAOIs, and miscellaneous antidepressants (SSRIs). The tricyclics work by blocking reuptake of norepinephrine and serotonin into nerve endings and increasing action of norepinephrine and serotonin in nerve cells. MAOIs act by increasing concentrations of endogenous EPINEPHrine, norepinephrine, serotonin, and dopamine in storage sites in the CNS by inhibition of MAO; increased concentration reduces depression.

**USES:** Antidepressants are used for depression and, in some cases, enuresis in children.

### CONTRAINDICATIONS

The contraindications for antidepressants are seizure disorders, prostatic hypertrophy, and severe renal/hepatic/cardiac disease depending on the type of medication.

**Precautions:** Antidepressants should be used cautiously in pregnant, geriatric, and suicidal patients; severe depression; schizophrenia; hyperactivity; and diabetes mellitus.

### IMPLEMENTATION

**PO route**

• Give increased fluids, bulk in diet if constipation, urinary retention occur
• Give with food or milk for GI symptoms
• Give gum, hard candy, or frequent sips of water for dry mouth
• Store in airtight container at room temperature; do not refreeze
• Provide assistance with ambulation during beginning therapy since drowsiness/dizziness occurs

**ADVERSE EFFECTS:** The most serious adverse reactions are paralytic ileus, acute renal failure, hypertension, and hypertensive crisis, depending on the specific product. Common side effects are dizziness, drowsiness, diarrhea, dry mouth, urinary retention, and orthostatic hypotension.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver and excreted in urine.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

### NURSING CONSIDERATIONS

#### Assessment

• Monitor B/P (lying, standing), pulse q4hr; if systolic B/P drops 20 mm Hg, hold product, notify prescriber; take VS q4hr in patients with CV disease
• Monitor blood tests: CBC, leukocytes, differential, cardiac enzymes if patient is receiving long-term therapy
• Monitor hepatic function tests: AST, ALT, bilirubin, creatinine
• Monitor weight weekly; appetite may increase with product

• Monitor for EPS primarily in geriatric: rigidity, dystonia, akathisia
• Assess mental status: mood, sensorium, affect, suicidal tendencies, increase in psychiatric symptoms (depression, panic)
• Check for urinary retention, constipation; constipation is more likely to occur in children, geriatric patients
• Assess for withdrawal symptoms: headache, nausea, vomiting, muscle pain, weakness; do not usually occur unless product was discontinued abruptly
• Identify alcohol consumption; if alcohol is consumed, hold dose until AM

### Patient/family education

• Teach patient that therapeutic effects may take 2-3 wk
• Advise patient to use caution in driving or other activities requiring alertness because of drowsiness, dizziness, blurred vision
• Caution patient to avoid alcohol ingestion, other CNS depressants
• Instruct patient not to discontinue medication quickly after long-term use; may cause nausea, headache, malaise
• Instruct patient to wear sunscreen or large hat, since photosensitivity may occur

### Evaluation

**Positive therapeutic outcome**
• Decreased depression

### Generic Names

*Tetracyclics:*
mirtazapine

*Tricyclics:*
amitriptyline, clomiPRAMINE, desipramine, doxepin, imipramine, nortriptyline

*Miscellaneous:*
buPROPion, DULoxetine, levomilnacipran, traZODone, venlafaxine, vortioxetine

*SSRIs:*
citalopram, escitalopram, FLUoxetine, PARoxetine, sertraline

## Antidiabetics

**ACTION:** Antidiabetics are divided into the insulins that decrease blood glucose, phosphate, and potassium and increase blood pyruvate and lactate and oral antidiabetics that cause functioning β-cells in the pancreas to release insulin and improve the effect of endogenous and exogenous insulin.

**USES:** Insulins are used for ketoacidosis and diabetes mellitus types 1 and 2; oral antidiabetics are used for diabetes mellitus type 2.

### CONTRAINDICATIONS

Hypersensitive reactions may occur, and allergies should be identified before these products are given. Oral antidiabetics should not be used in juvenile or brittle diabetes, diabetic ketoacidosis, or severe renal/hepatic disease.

**Precautions:** Oral antidiabetics should be used with caution in pregnancy, breastfeeding, geriatric, cardiac disease, and in the presence of alcohol.

### IMPLEMENTATION

**PO route**
• Give oral antidiabetic 30 min before meals

**SUBCUT route**
• Give insulin after warming to room temperature by rotating in palms to prevent lipodystrophy from injecting cold insulin
• Give human insulin to those allergic to beef or pork
• Rotate inj sites when giving insulin; use abdomen, upper back, thighs, upper arm, buttocks; keep a record of sites

**ADVERSE EFFECTS:** The most common side effect of insulin and oral antidiabetics is hypoglycemia. Other adverse reactions for oral antidiabetics include blood dyscrasias, hepatotoxicity, and, rarely, cholestatic jaundice. Adverse reactions for insulin products include allergic responses and, more rarely, anaphylaxis.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Oral antidiabetics are metabolized in the liver, with metabolites excreted in urine, bile, and feces.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

### NURSING CONSIDERATIONS

#### Assessment

• Monitor blood, urine glucose levels during treatment to determine diabetes control (oral products)
• Monitor fasting blood glucose, 2 hr PP (60-100 mg/dl normal fasting level) (70-130 mg/dl—normal 2-hr level)
• Assess for hypoglycemic reaction that can occur during peak time

#### Patient/family education

• Advise patient to avoid alcohol and salicylates except on advice of prescriber

• Teach patient symptoms of ketoacidosis: nausea, thirst, polyuria, dry mouth, decreased B/P, dry, flushed skin, acetone breath, drowsiness, Kussmaul respirations
• Teach patient symptoms of hypoglycemia: headache, tremors, fatigue, weakness; that candy or sugar should be carried to treat hypoglycemia
• Advise patient to test urine for glucose/ketones tid if this product is replacing insulin
• Advise patient to continue weight control, dietary restrictions, exercise, hygiene

### Evaluation

**Positive therapeutic outcome**
• Decrease in polyuria, polydipsia, polyphagia
• Clear sensorium
• Absence of dizziness
• Stable gait

### Generic Names

albiglutide, canagliflozin, dapagliflozin, **dulaglutide** (high alert), empagliflozin, ertupiflozin, erttuglifloxacin, glipiZIDE, glyBURIDE, **insulin aspart** (high alert), **insulin detemir** (high alert), **insulin glargine** (high alert), **insulin glulisine** (high alert), **insulin lispro** (high alert), **insulin, regular** (high alert), **insulin, regular concentrated** (high alert), insulin, zinc suspension (Lente), insulin, zinc suspension extended (Ultralente), liraglutide, linagliptin, metFORMIN, miglitol, pioglitazone, repaglinide, rosiglitazone, saxagliptin, semaglutide, sitaGLIPtin

## Antidiarrheals

**ACTION:** Antidiarrheals work by various actions including direct action on intestinal muscles to decrease GI peristalsis or by inhibiting prostaglandin synthesis responsible for GI hypermotility, acting on mucosal receptors responsible for peristalsis, or decreasing water content of stools.

**USES:** Antidiarrheals are used for diarrhea of undetermined causes.

### CONTRAINDICATIONS

The contraindications are persons with severe ulcerative colitis, and pseudomembranous colitis with some products.

**Precautions:** Antidiarrheals should be used with caution in pregnancy, breastfeeding, children, geriatric patients, dehydration.

### IMPLEMENTATION

**PO route**
• Give for 48 hr only

**ADVERSE EFFECTS:** The most serious adverse reactions of some products are paralytic ileus, toxic megacolon, and angioneurotic edema. The most common side effects are constipation, nausea, dry mouth, and abdominal pain.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver and excreted in urine.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

### NURSING CONSIDERATIONS

#### Assessment

• Monitor electrolytes (potassium, sodium, chloride) if on long-term therapy
• Monitor bowel pattern before; for rebound constipation after termination of medication
• Assess response after 48 hr; if no response, product should be discontinued
• Identify dehydration in children

#### Patient/family education

• Advise patient to avoid OTC products
• Caution patient not to exceed recommended dose

#### Evaluation

**Positive therapeutic outcome**
• Decreased diarrhea

### Generic Names

bismuth subsalicylate, kaolin/pectin, loperamide

## Antidysrhythmics

**ACTION:** Antidysrhythmics are divided into four classes and miscellaneous antidysrhythmics:
• Class I increases the duration of action potential and the effective refractory period and reduces disparity in the refractory period between a normal and infarcted myocardium; further subclasses include Ia, Ib, Ic
• Class II decreases the rate of SA node discharge, increases recovery time, slows conduction through the AV node, and decreases heart rate, which decreases $O_2$ consumption in the myocardium
• Class III increases the duration of action potential and the effective refractory period
• Class IV inhibits calcium ion influx across the cell membrane during cardiac depolarization; decreases SA node discharge, decreases conduction velocity through the AV node

• Miscellaneous antidysrhythmics include those such as adenosine, which slows conduction through the AV node, and digoxin, which decreases conduction velocity and prolongs the effective refractory period in the AV node

**USES:** Antidysrhythmics are used for PVCs, tachycardia, hypertension, atrial fibrillation, and angina pectoris.

## CONTRAINDICATIONS

Contraindications vary widely among products.

**Precautions:** Precautions vary widely among products.

**ADVERSE EFFECTS:** Side effects and adverse reactions vary widely among products.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

## NURSING CONSIDERATIONS

### Assessment

• Monitor ECG continuously to determine product effectiveness, PVCs, or other dysrhythmias
• Assess for dehydration or hypovolemia
• Monitor B/P continuously for hypo/hypertension
• Monitor I&O ratio
• Monitor serum potassium
• Assess for edema in feet and legs daily

### Patient/family education

• Advise patient to comply with dosage schedule, even if patient is feeling better
• Instruct patient to report bradycardia, dizziness, confusion, depression, fever

### Evaluation

**Positive therapeutic outcome**

• Decrease in B/P in hypertension
• Decreased B/P, edema, moist crackles in HF

### Generic Names

*Class Ia:*
disopyramide, procainamide, quiNIDine

*Class Ib:*
**lidocaine, parenteral** (high alert), phenytoin

*Class Ic:*
flecainide, propafenone

*Class II:*
acebutolol, esmolol, propranolol, sotalol

*Class III:*
**amiodarone** (high alert), **dronedarone** (high alert), **ibutilide** (high alert)

*Class IV:*
verapamil

*Miscellaneous:*
**adenosine** (high alert), **atropine** (high alert), **digoxin** (high alert)

# Antiemetics

**ACTION:** The antiemetics are divided into the 5-$HT_3$ receptor antagonists, the phenothiazines, and the miscellaneous products. The 5-$HT_3$ receptor antagonists work by blocking serotonin peripherally, centrally, and in the small intestine. The phenothiazines act by blocking the chemoreceptor trigger zone in the brain. The miscellaneous products work by either decreasing motion sickness or delaying gastric emptying.

**USES:** Antiemetics are used to prevent nausea and vomiting due to cancer chemotherapy, radiotherapy, and surgery (5-$HT_3$ receptor antagonists); some of the miscellaneous products (antihistamines) work by decreasing motion sickness. Most other products are used for many types of nausea and vomiting.

## CONTRAINDICATIONS

Persons developing hypersensitive reactions should not use these products.

**Precautions:** Antiemetics should be used cautiously in pregnancy, breastfeeding, hepatic disease, and some GI disorders.

## IMPLEMENTATION

• Give prophylactically, before nausea and vomiting occur, in cancer chemotherapy
• Store at room temperature vial/ampules, oral products

**ADVERSE EFFECTS:** The most common side effects are headache, dizziness, fatigue, and diarrhea.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized by the liver and excreted by the kidneys.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information. Other CNS depressants increase CNS depression.

## NURSING CONSIDERATIONS

### Assessment

• Assess reason for nausea, vomiting; absence of nausea and vomiting after giving product
• Monitor hypersensitivity reactions: rash, bronchospasm with some products

### Patient/family education

- Caution patient to avoid hazardous activities if dizziness occurs; ask for assistance if hospitalized
- Instruct patient to rise slowly to prevent orthostatic hypotension
- Teach patient all aspects of product usage
- Teach patient conservative methods to control nausea and vomiting such as sips of water or other fluids and dry crackers

### Evaluation

**Positive therapeutic outcome**

- Absence or decreasing nausea and vomiting after use

### Generic Names

*5-$HT_3$ antagonists:*
dolasetron, granisetron, ondansetron, palonosetron

*Phenothiazines:*
chlorproMAZINE, prochlorperazine, promethazine

*Miscellaneous:*
aprepitant, meclizine, metoclopramide, scopolamine, trimethobenzamide

## Antifungals (systemic)

**ACTION:** Antifungals act by increasing cell membrane permeability in susceptible organisms by binding sterols and decreasing potassium, sodium, and nutrients in the cell.

**USES:** Antifungals are used for infections of histoplasmosis, blastomycosis, coccidioidomycosis, cryptococcosis, aspergillosis, phycomycosis, candidiasis, sporotrichosis causing severe meningitis, septicemia, and skin infections.

### CONTRAINDICATIONS

Persons with severe bone marrow depression or hypersensitivity should not use these products.

**Precautions:** Antifungals should be used with caution in renal/hepatic disease and pregnancy.

### IMPLEMENTATION

**IV route**

- Give by **IV** using in-line filter (mean pore diameter >1 μm) using distal veins; check for extravasation, necrosis q8hr
- Give product only after C&S confirms organism, make sure product is used in life-threatening infections
- Provide protection from light during infusion; cover with foil
- Give symptomatic treatment as ordered for adverse reactions: aspirin, antihistamines, antiemetics, antispasmodics
- Store protected from moisture and light; diluted sol is stable for 24 hr

**ADVERSE EFFECTS:** The most serious adverse reactions include renal tubular acidosis, permanent renal impairment, anuria, oliguria, hemorrhagic gastroenteritis, acute liver failure, and blood dyscrasias. Some common side effects include hypokalemia, nausea, vomiting, anorexia, headache, fever, and chills.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver and excreted in urine.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

### NURSING CONSIDERATIONS

#### Assessment

- Monitor VS q15-30min during first infusion; note changes in pulse, B/P
- Monitor I&O ratio; watch for decreasing urinary output, change in specific gravity; discontinue product to prevent permanent damage to renal tubules
- Monitor blood tests; CBC, potassium, sodium, calcium, magnesium q2wk
- Monitor weight weekly; if weight increases over 2 lb/wk, edema is present; renal damage should be considered
- Assess for renal toxicity: increasing BUN, if >40 mg/dl or if serum creatinine >3 mg/dl; product may be discontinued or dosage reduced
- Assess for hepatotoxicity: increasing AST, ALT, alkaline phosphatase, bilirubin
- Assess for allergic reaction: dermatitis, rash; product should be discontinued; antihistamines (mild reaction) or EPINEPHrine (severe reaction) administered
- Assess for hypokalemia: anorexia, drowsiness, weakness, decreased reflexes, dizziness, increased urinary output, increased thirst, paresthesias
- Assess for ototoxicity: tinnitus (ringing, roaring in ears), vertigo, loss of hearing (rare)

#### Patient/family education

- Teach patient that long-term therapy may be needed to clear infection (2 wk-3 mo depending on type of infection)

#### Evaluation

**Positive therapeutic outcome**

- Decreased fever, malaise, rash
- Negative C&S for infecting organism

### Generic Names

amphotericin B, anidulafungin, fluconazole, isavuconazonium, itraconazole, ketoconazole, micafungin, nystatin, posaconazole, voriconazole

## Antihistamines

**ACTION:** Antihistamines compete with histamines for $H_1$ receptor sites. They antagonize in varying degrees most of the pharmacologic effects of histamines.

**USES:** Antihistamines are used to control the symptoms of allergies, rhinitis, and pruritus.

### CONTRAINDICATIONS

Hypersensitivity to $H_1$-receptor antagonists occurs rarely. Patients with acute asthma and lower respiratory tract disease should not use these products since thick secretions may result. Other contraindications include closed-angle glaucoma, bladder neck obstruction, stenosing peptic ulcer, symptomatic prostatic hypertrophy, breastfeeding, and in the newborn.

**Precautions:** Antihistamines must be used cautiously in conjunction with intraocular pressure since they increase intraocular pressure. Caution should also be used in pregnancy, breastfeeding, and geriatric patients and patients with renal/cardiac disease, hypertension, and seizure disorders.

**ADVERSE EFFECTS:** Most products cause drowsiness; however, loratadine and fexofenadine produce little, if any, drowsiness. Other common side effects are headache and thickening of bronchial secretions. Serious blood dyscrasias may occur, but are rare. Urinary retention, GI effects occur with many of these products.

**PHARMACOKINETICS:** Onset varies from 20-60 min, with duration lasting 4-24 hr. In general, pharmacokinetics vary widely among products.

**INTERACTIONS:** Barbiturates, opioids, hypnotics, tricyclics, and alcohol can increase CNS depression when taken with antihistamines.

### NURSING CONSIDERATIONS

#### Assessment

- Check I&O ratio; be alert for urinary retention, frequency, dysuria; product should be discontinued if these occur
- Assess for blood dyscrasias: thrombocytopenia, agranulocytosis (rare)
- Assess for respiratory status, including rate, rhythm, increase in bronchial secretions, wheezing, chest tightness
- Assess for cardiac status, including palpitations, increased pulse, hypotension
- Assess CBC during long-term therapy, since hemolytic anemia, although rare, may occur
- Administer with food or milk to decrease GI symptoms; absorption may be decreased slightly
- Administer whole (sus rel tab)
- Provide hard candy, gum, frequent rinsing of mouth for dryness

#### Patient/family education

- Advise patient to notify prescriber if confusion, sedation, hypotension occur
- Caution patient to avoid driving and other hazardous activity if drowsiness occurs
- Instruct patient to avoid concurrent use of alcohol and other CNS depressants
- Inform patient to discontinue a few days before skin testing

#### Evaluation

**Positive therapeutic outcome**

- Absence of allergy symptoms, itching

### Generic Names

brompheniramine, budesonide, cetirizine, chlorpheniramine, cyproheptadine, desloratadine, diphenhydrAMINE, fexofenadine, levocetirizine, loratadine, promethazine

## Antihypertensives

**ACTION:** Antihypertensives are divided into angiotensin converting enzyme (ACE) inhibitors, β-adrenergic blockers, calcium channel blockers, centrally acting adrenergics, diuretics, peripherally acting antiadrenergics, and vasodilators. β-blockers, calcium channel blockers, and diuretics are discussed in separate sections. ACE inhibitors selectively suppress conversion of renin-angiotensin I to angiotensin II; dilatation of arterial and venous vessels occurs. Centrally acting adrenergics act by inhibiting the sympathetic vasomotor center in the CNS, which reduces impulses in the sympathetic nervous system; blood pressure, pulse rate, and cardiac output decrease. Peripherally acting antiadrenergics inhibit sympathetic vasoconstriction by inhibiting release of norepinephrine and/or depleting norepinephrine stores in adrenergic nerve endings. Vasodilators act on arteriolar smooth muscle by producing direct relaxation or vasodilatation; a reduction in blood pressure, with concomitant increases in heart rate and cardiac output, occurs.

**USES:** Antihypertensives are used for hypertension and for heart failure not responsive to conventional therapy. Some products are used in hypertensive crisis, angina, and for some cardiac dysrhythmias.

## CONTRAINDICATIONS

Hypersensitive reactions may occur, and allergies should be identified before these products are given. Antihypertensives should not be used in children or in patients with heart block.

**Precautions:** Antihypertensives should be used with caution in geriatric and dialysis patients, and in the presence of hypovolemia, leukemia, and electrolyte imbalances.

## IMPLEMENTATION

- Place patient in supine or Trendelenburg position for severe hypotension

**ADVERSE EFFECTS:** The most common side effects are marked hypotension, bradycardia, tachycardia, headache, nausea, and vomiting. Side effects and adverse reactions may vary widely between classes and specific products.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver, with metabolites excreted in urine, bile, and feces.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

## NURSING CONSIDERATIONS

### Assessment

- Monitor blood tests: neutrophil; decreased platelets occur with many of the products
- Monitor renal function tests: protein, BUN, creatinine; watch for increased levels, which may indicate nephrotic syndrome; obtain baselines in renal/hepatic function tests before beginning treatment
- Assess for edema in feet and legs daily
- Identify allergic reaction, including rash, fever, pruritus, urticaria: product should be discontinued if antihistamines fail to help
- Identify symptoms of HF: edema, dyspnea, wet crackles, B/P
- Assess for renal symptoms: polyuria, oliguria, frequency

### Patient/family education

- Instruct patient to comply with dosage schedule, even if feeling better
- Advise patient to rise slowly to sitting or standing position to minimize orthostatic hypotension

### Evaluation

#### Positive therapeutic outcome

- Decrease in B/P in hypertension
- Decreased B/P, edema, moist crackles in HF

### Generic Names

*Angiotensin-converting enzyme inhibitors:*
benazepril, enalapril, fosinopril, lisinopril, quinapril, ramipril, trandolapril

*Angiotensin II receptor blockers:*
azilsartan, candesartan, eprosartan, irbesartan, losartan, olmesartan, telmisartan, valsartan

*Centrally acting adrenergics:*
cloNIDine, guanFACINE, methyldopa

*Peripherally acting antiadrenergics:*
doxazosin, prazosin, reserpine

*Vasodilators:*
ambrisentan, fenoldopam, hydrALAZINE, macitentan, minoxidil, **nitroprusside** (high alert)

*Antiadrenergic: Combined α/β-blocker:*
labetalol

*Direct renin inhibitors:*
aliskiren

# Antiinfectives

**ACTION:** Antiinfectives are divided into several groups, which include but are not limited to penicillins, cephalosporins, aminoglycosides, sulfonamides, tetracyclines, monobactam, erythromycins, and quinolones. These products inhibit the growth and replication of susceptible bacterial organisms.

**USES:** Antiinfectives are used for infections of susceptible organisms. These products are effective against bacterial, rickettsial, and spirochete infections.

## CONTRAINDICATIONS

Hypersensitive reactions may occur, and allergies should be identified before these products are given. Cross-sensitivity can occur between products of different classes (penicillins or cephalosporins). Often persons allergic to penicillins are also allergic to cephalosporins.

**Precautions:** Antiinfectives should be used with caution in persons with renal/hepatic disease.

## IMPLEMENTATION

- Give for 10-14 days to ensure organism death, prevention of superinfection
- Give after C&S completed; product may be taken as soon as culture is obtained

**ADVERSE EFFECTS:** The most common side effects are nausea, vomiting, and diarrhea. Adverse reactions include bone marrow depression and anaphylaxis.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver. Metabolites are excreted in urine, bile, and feces.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

## NURSING CONSIDERATIONS

### Assessment

- Assess for nephrotoxicity: increased BUN, creatinine
- Monitor blood tests: AST, ALT, CBC, Hct, bilirubin; test monthly if patient is on long-term therapy
- Monitor bowel pattern daily; if severe diarrhea occurs, product should be discontinued
- Monitor urine output; if decreasing, notify prescriber; may indicate nephrotoxicity
- Assess for allergic reaction: rash, fever, pruritus, urticaria; product should be discontinued
- Assess for bleeding: ecchymosis, bleeding gums, hematuria, stool guaiac daily
- Assess for overgrowth of infection: perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum

### Patient/family education

- Teach patient to comply with dosage schedule, even if feeling better
- Advise patient to report sore throat, bruising, bleeding, joint pain; may indicate blood dyscrasias (rare)

### Evaluation

**Positive therapeutic outcome**

- Absence of fever, fatigue, malaise, draining wounds

### Generic Names

*Aminoglycosides:*
amikacin, azithromycin, clarithromycin, gentamicin, neomycin, streptomycin, tobramycin

*Cephalosporins:*
cefaclor, cefadroxil, ceFAZolin, cefdinir, cefditoren, cefepime, cefixime, cefotaxime, cefprozil, ceftibuten, cefuroxime, cephalexin, cephradine

*Fluoroquinolones:*
ciprofloxacin, gemifloxacin, levofloxacin, norfloxacin, ofloxacin

*Ketolides:*
telithromycin

*Miscellaneous:*
adefovir, dalbavancin, DAPTOmycin, delafloxacin, doripenem, ertapenem, fidaxomicin, meropenem, meropenem/vaborbactam, oritavancin, peginterferon alfa-2a, telavancin, vancomycin

*Penicillins:*
amoxicillin/clavulanate, ampicillin/sulbactam, imipenem/cilastatin, nafcillin, penicillin G benzathine, penicillin G, penicillin G procaine, penicillin V, piperacillin/tazobactam, ticarcillin, ticarcillin/clavulanate

*Sulfonamides:*
sulfaSALAzine

*Tetracyclines:*
doxycycline, minocycline, tetracycline

## Antilipidemics

**ACTION:** Antilipidemics are divided into three categories or subclassifications; HMG-CoA reductase inhibitors (statins), bile acid sequestrants, and miscellaneous products. The HMG-CoA reductase inhibitors work by reduction of an enzyme that is responsible for the beginning step in cholesterol production. Bile acid sequestrants work by binding cholesterol in the GI system. The miscellaneous products work by various actions.

**USES:** Primary hypercholesterolemia in individuals as an adjunct with other lifestyle changes.

### CONTRAINDICATIONS

Persons breastfeeding (some products) or those with hypersensitivity to any product or severe hepatic disease should not take these products. Antilipidemics are identified as pregnancy on some products.

**Precautions:** Some products are identified as pregnancy.

### IMPLEMENTATION

- Give as directed by health care provider; times will vary with medication used
- Provide protection from sunlight and heat

**ADVERSE EFFECTS:** The most common side effects are headache, dizziness, fatigue, insomnia, peripheral edema, dysrhythmias, sinusitis, pharyngitis, abdominal pain, diarrhea, constipation, flatulence, and back pain.

**PHARMACOKINETICS:** Pharmacokinetics and pharmacodynamics vary with each product.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

## NURSING CONSIDERATIONS

### Assessment

- Obtain a diet and lifestyle history, including exercise, smoking, alcohol, and stress-related activities

### Patient/family education

- Teach patient all aspects of medication use
- Instruct patient to combine medication with lifestyle changes, including low-cholesterol diet, decreasing LDL in diet; avoid smoking, alcohol, and sedentary daily routine

### Evaluation

**Positive therapeutic outcome**

- Decrease in triglycerides and LDL cholesterol levels

### Generic Names

*HMG-CoA reductase inhibitors:*
atorvastatin, fluvastatin, lovastatin, pitavastatin, pravastatin, simvastatin

*Bile acid sequestrants:*
cholestyramine, colesevelam

*Miscellaneous:*
alirocumab, evolocumab, ezetimibe, fenofibrate, fenofibric acid, gemfibrozil, mipomersen, niacin, niacinamide

# Antineoplastics

**ACTION:** Antineoplastics are divided into alkylating agents, antimetabolites, antibiotic agents, hormonal agents, and miscellaneous agents. Alkylating agents act by cross-linking strands of DNA. Antimetabolites act by inhibiting DNA synthesis. Antibiotic agents act by inhibiting RNA synthesis and by delaying or inhibiting mitosis. Hormones alter the effect of androgens, luteinizing hormone, follicle-stimulating hormone, or estrogen by changing the hormonal environment.

**USES:** Antineoplastics vary widely among products and classes of products. They are used to treat leukemia, Hodgkin's disease, lymphomas, and other tumors throughout the body.

## CONTRAINDICATIONS

Hypersensitive reactions may occur, and allergies should be identified before these products are given. Also, persons with severe renal/hepatic disease should not use these products unless the benefits outweigh the risks.

**Precautions:** Persons with bleeding, severe bone marrow depression, or renal/hepatic disease should be watched closely.

## IMPLEMENTATION

- Check **IV** site for irritation; phlebitis
- Have EPINEPHrine available for hypersensitivity reaction
- Give antibiotics for prophylaxis of infection
- Provide strict medical asepsis, protective isolation if WBC levels are low
- Provide comprehensive oral hygiene, using careful technique and soft-bristle brush

**ADVERSE EFFECTS:** Most products cause thrombocytopenia, leukopenia, and anemia. If these reactions occur, the product may need to be stopped until the problem is corrected. Other side effects include nausea, vomiting, glossitis, and hair loss. Some products also cause hepatotoxicity, nephrotoxicity, and cardiotoxicity.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products cross the placenta and are excreted in breast milk and in urine.

**INTERACTIONS:** Toxicity may occur when used with other antineoplastics or radiation.

## NURSING CONSIDERATIONS

### Assessment

- Monitor CBC, differential, platelet count weekly; withhold product if WBC is <4000 or platelet count is <75,000; notify prescriber of results
- Monitor renal function tests: BUN, creatinine, serum uric acid, and urine creatinine clearance before, during therapy
- Monitor I&O ratio; report fall in urine output of 30 ml/hr
- Monitor temp q4hr (may indicate beginning infection)
- Monitor hepatic function tests before, during therapy (bilirubin, AST, ALT, LDH) monthly or as needed
- Assess for bleeding, including hematuria, guaiac, bruising or petechiae, mucosa, or orifices q8hr; obtain prescription for viscous lidocaine (Xylocaine)
- Identify jaundice of skin, sclera, dark urine, clay-colored stools, itchy skin, abdominal pain, fever, diarrhea
- Assess for edema in feet, joint pain, stomach pain, shaking
- Assess for inflammation of mucosa, breaks in skin

### Patient/family education

- Advise patient to report signs of infection, including increased temp, sore throat, malaise

• Instruct patient to report signs of anemia, including fatigue, headache, faintness, shortness of breath, irritability
• Instruct patient to report bleeding and to avoid use of razors and commercial mouthwash

### Evaluation

**Positive therapeutic outcome**
• Decreased tumor size

### Generic Names

*Alkylating agents:*
bendamustine, **busulfan** (high alert), **CARBOplatin** (high alert), **carmustine** (high alert), chlorambucil, **CISplatin** (high alert), **cyclophosphamide** (high alert), **dacarbazine** (high alert), **melphalan** (high alert), oxaliplatin

*Antimetabolites:*
capecitabine, **cytarabine** (high alert), decitabine, **etoposide** (high alert), **fluorouracil** (high alert), mercaptopurine, **methotrexate** (high alert), PEMEtrexed

*Antibiotic agents:*
**bleomycin** (high alert), **DACTINomycin** (high alert), **DAUNOrubicin** (high alert), **DOXOrubicin** (high alert), **mitoMYcin** (high alert), **mitoXANtrone** (high alert)

*Hormonal agents:*
flutamide, fulvestrant, goserelin, **irinotecan** (high alert), **leuprolide** (high alert), megestrol, tamoxifen, **topotecan** (high alert)

*Miscellaneous agents:*
abemaciclib, acalabrutinib, ado-trastuzumab, afatinib, alemtuzumab, anastrozole, axicabtegene, azaCITIDine, belinostat, bortezomib, brentuximab, cabazitaxel, **ceritinib** (high alert), cetuximab, crizotinib, dabrafenib, dasatinib, durvalumab, enasidenib, eribulin, erlotinib, gemcitabine, ibritumomab, ibrutinib, idelalisib, imatinib, interferon alfa-2a, interferon alfa-2b, ipilimumab, irinotecan, ixabepilone, lapatinib, midostaurin, nilotinib, niraparib, olaparib, palbociclib, panitumumab, pembrolizumab, pomalidomide, procarbazine, ranibizumab, riTUXimab, sipuleucel-T, sonidegib, tisagenlecleucel, trametinib, vemurafenib, **vinBLAStine** (high alert), **vinCRIStine** (high alert), **vinorelbine** (high alert)

## Antiparkinsonian Agents

**ACTION:** Antiparkinsonian agents are divided into cholinergics, dopamine agonists, and monoamine oxidase type B inhibitors. Cholinergics work by blocking or competing at central acetylcholine receptors. Dopamine agonists work by decarboxylation to dopamine or by activation of dopamine receptors. Monoamine oxidase type B inhibitors increase dopamine activity by inhibiting MAO type B activity.

**USES:** Antiparkinson agents are used alone or in combination for patients with Parkinson's disease.

### CONTRAINDICATIONS

Persons with hypersensitivity, closed-angle glaucoma, and undiagnosed skin lesions should not use these products.

**Precautions:** Antiparkinsonian agents should be used with caution in pregnancy, breastfeeding, children, renal/cardiac/hepatic disease, and affective disorder.

### IMPLEMENTATION

• Give product up until NPO before surgery
• Adjust dosage depending on patient response
• Give with meals; limit protein taken with product
• Give only after MAOIs have been discontinued for 2 wk
• Assist with ambulation during beginning therapy if needed
• Test for diabetes mellitus and acromegaly if on long-term therapy

**ADVERSE EFFECTS:** Side effects and adverse reactions vary widely among products. The most common side effects include involuntary movements, headache, numbness, insomnia, nightmares, nausea, vomiting, dry mouth, and orthostatic hypotension.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver and excreted in urine.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

### NURSING CONSIDERATIONS

#### Assessment

• Monitor B/P, respiration
• Assess mental status: affect, behavioral changes, depression, complete suicide assessment

#### Patient/family education

• Advise patient to change positions slowly to prevent orthostatic hypotension
• Instruct patient to report side effects: twitching, eye spasm; indicate overdose
• Advise patient to use product exactly as prescribed; if product is discontinued abruptly, parkinsonian crisis may occur

### Evaluation

**Positive therapeutic outcome**
- Decrease in akathisia
- Improvement in mood

### Generic Names
amantadine, benztropine, bromocriptine, carbidopa-levodopa, pramipexole, rasagiline, selegiline, tolcapone

## Antiplatelets

**ACTION:** The antiplatelets are divided into the platelet aggregation inhibitors, platelet adhesion inhibitors, and the glycoprotein IIb, IIIa inhibitors. The platelet aggregation inhibitors work by action on thrombin; the platelet adhesion inhibitors work by inhibition of phosphodiesterase; and the glycoprotein IIb, IIIa inhibitors work by preventing fibrin from binding to glycoprotein IIb, IIIa receptors.

**USES:** Antiplatelets are used to prevent myocardial infarction and stroke; other products are used for coronary syndromes.

### CONTRAINDICATIONS
Persons developing hypersensitive reactions should not use these products.

**Precautions:** Antiplatelets should be used cautiously in pregnancy, breastfeeding, and bleeding disorders.

### IMPLEMENTATION
- Give with heparin or other aspirin (some products)
- Store at room temperature vial/ampules, oral products

**ADVERSE EFFECTS:** The most common side effects are headache, dizziness, bleeding, and diarrhea.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized by the liver and excreted by the kidneys.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

### NURSING CONSIDERATIONS
#### Assessment
- Assess reason for use of these products
- Monitor hypersensitivity reactions with some products
- Monitor bleeding from orifices, stool urine
- Monitor blood tests: platelets, Hgb, Hct, PT/APTT, and INR

#### Patient/family education
- Caution patient to avoid hazardous activities if drowsiness, dizziness occurs; ask for assistance if hospitalized
- Teach patient all aspects of product usage

#### Evaluation

**Positive therapeutic outcome**
- Absence of MI, stroke, or other coronary syndromes

### Generic Names
*Platelet aggregation inhibitors:*
cilostazol, clopidogrel, ticagrelor, ticlopidine

*Platelet adhesion inhibitors:*
dipyridamole

*Glycoprotein IIb, IIIa inhibitors:*
**eptifibatide** (high alert), **tirofiban** (high alert)

## Antipsychotics

**ACTION:** Antipsychotics/neuroleptics are divided into several subgroups: phenothiazines, thioxanthenes, butyrophenones, dibenzoxazepines, dibenzodiazepines, and indolones and other heterocyclic compounds. Although chemically different, these subgroups share many pharmacologic and clinical properties. All antipsychotics work to block postsynaptic DOPamine receptors in the brain that are responsible for psychotic behavior, including hallucinations, delusions, and paranoia.

**USES:** Antipsychotic behavior is decreased in conditions such as schizophrenia, paranoia, and mania. These agents are also effective for severe anxiety, intractable hiccups, nausea, vomiting, behavioral problems in children, and for relaxation before surgery.

### CONTRAINDICATIONS
Persons with liver damage, severe hypertension or coronary disease, cerebral arteriosclerosis, blood dyscrasias, bone marrow depression, parkinsonism, severe depression, or closed-angle glaucoma; children $<12$ yr; persons withdrawing from alcohol or barbiturates should not use antipsychotics until these conditions are corrected.

**Precautions:** Caution must be used when antipsychotics are given to geriatric patients, since metabolism is slowed and adverse reactions can occur rapidly. Renal/hepatic disease may cause poor metabolism and excretion of the product. Seizure threshold is decreased with these products; increases in the dose of anticonvulsants may be required. Persons with diabetes

mellitus, prostatic hypertrophy, chronic respiratory disease, and peptic ulcer disease should be monitored closely.

## IMPLEMENTATION

- Give antiparkinsonian agent if extrapyramidal symptoms occur
- Administer liquid conc mixed in glass of juice or cola since taste is unpleasant; avoid contact with skin when preparing liquid conc or parenteral medications
- Supervise ambulation until stabilized on medication; do not involve in strenuous exercise program, since fainting is possible; patient should not stand still for long periods
- Increase fluids to prevent constipation
- Give sips of water, candy, gum for dry mouth
- Patient should remain lying down for at least 30 min after IM inj

**ADVERSE EFFECTS:** The most common side effects include extrapyramidal symptoms such as pseudoparkinsonism, akathisia, dystonia, and tardive dyskinesia, which may be controlled by use of antiparkinsonian agents. Serious adverse reactions such as hypotension, agranulocytosis, cardiac arrest, and laryngospasm have occurred. Other common side effects include dry mouth and photosensitivity.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely with different products and routes. Products are metabolized by the liver, are excreted in urine as metabolites, are highly bound to plasma proteins, cross the placenta, and enter breast milk. Half-life can be extended over 3 days.

**INTERACTIONS:** Because other CNS depressants can cause oversedation, these combinations should be used carefully. Anticholinergics may decrease the therapeutic actions of phenothiazines and also cause increased anticholinergic effects.

## NURSING CONSIDERATIONS

### Assessment

- Monitor bilirubin, CBC, hepatic function tests monthly, since these products are metabolized in the liver and excreted in urine
- Monitor I&O ratio: palpate bladder if low urinary output occurs, since urinary retention occurs with many of these products
- Assess affect, orientation, LOC, reflexes, gait, coordination, sleep pattern disturbances
- Assess dizziness, faintness, palpitations, tachycardia on rising
- Check B/P with patient lying and standing; wide fluctuations between lying and standing B/P may require dosage or product change, since orthostatic hypotension is occurring
- Assess for EPS, including akathisia, tardive dyskinesia, pseudoparkinsonism

### Patient/family education

- Advise patient to rise from sitting or lying position gradually, since fainting may occur
- Caution patient to avoid hot tubs, hot showers, or tub baths, since hypotension may occur
- Advise patient to wear sunscreen or protective clothing to prevent burns
- Advise patient to take extra precautions during hot weather to stay cool; heat stroke can occur
- Caution patient to avoid driving and other activities requiring alertness until response to medication is known
- Inform patient that drowsiness or impaired mental/motor activity is evident the first 2 wk, but tends to decrease over time

### Evaluation

**Positive therapeutic outcome**

- Decrease in excitement, hallucinations, delusions, paranoia
- Reorganization of thought patterns, speech

---

### Generic Names

*Phenothiazines:*
chlorproMAZINE, fluPHENAZine

*Butyrophenone:*
haloperidol

*Miscellaneous:*
ARIPiprazole, asenapine, iloperidone, loxapine, OLANZapine, paliperidone, QUEtiapine, risperiDONE, ziprasidone

# Antipyretics

**ACTION:** The antipyretics act on the CNS to control fever and also inhibit prostaglandin production.

**USES:** Antipyretics are used to decrease fever.

## CONTRAINDICATIONS

Persons developing hypersensitive reactions should not use these products.

**Precautions:** Antipyretics should be used cautiously in pregnancy, breastfeeding, geriatric patients, hepatic disease, and those with certain GI disorders.

## IMPLEMENTATION

- Give around the clock to keep fever reduced
- Store at room temperature

**ADVERSE EFFECTS:** The most common side effects are nausea, vomiting, and rash.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized by the liver and excreted by the kidneys.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

## NURSING CONSIDERATIONS

### Assessment

- Monitor temp frequently
- Assess reason for use and expected outcome
- Monitor hypersensitivity reactions: rash, bronchospasm with some products

### Patient/family education

- Teach patient all aspects of product usage

### Evaluation

**Positive therapeutic outcome**

- Absence or decreasing fever after use

---

### Generic Names

acetaminophen, aspirin, choline/magnesium salicylates, ibuprofen, ketoprofen, magnesium salicylate, naproxen, salsalate

## Antiretrovirals

**ACTION:** Antiretrovirals act by blocking DNA synthesis.

**USES:** Antiretrovirals are used in HIV infections, chronic hepatitis C to slow the progression of the disease.

## CONTRAINDICATIONS

Persons with hypersensitivity should not use these products.

**Precautions:** Antiretrovirals should be used cautiously in pregnancy, breastfeeding, and renal/hepatic disease. Protease inhibitors should be used cautiously in diabetes.

## IMPLEMENTATION

- Give in equal intervals around the clock
- Store at room temperature

**ADVERSE EFFECTS:** The most common side effects are nausea, vomiting, anorexia, headache, and diarrhea. The most serious adverse reactions are nephrotoxicity and blood dyscrasias.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized by the liver and excreted by the kidneys.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

## NURSING CONSIDERATIONS

### Assessment

- Monitor for signs of HIV infection: increased CD4 counts, decreased viral load; signs of chronic hepatitis C
- Monitor patients with compromised renal system; since product is excreted slowly in poor renal system function, toxicity may occur rapidly

### Patient/family education

- Instruct patient to report sore throat, fever, fatigue; may indicate superinfection
- Caution patient that product does not cure condition or prevent infecting others, but controls symptoms
- Instruct patient that product must be taken around the clock, in equal intervals to maintain blood levels for duration of therapy
- Instruct patient to notify prescriber of side effects such as bruising, bleeding, fatigue, malaise; may indicate blood dyscrasias

### Evaluation

**Positive therapeutic outcome**

- Decreased viral load
- Increased CD4 count
- Improvement in the symptoms of HIV/AIDS

---

### Generic Names

*Nonnucleoside reverse transcriptase inhibitors:*
delavirdine, efavirenz, etravirine, nevirapine, rilpivirine

*Nucleoside reverse transcriptase inhibitors:*
abacavir, didanosine, emtricitabine, lamiVUDine, stavudine d4t, tenofovir, zidovudine

*Protease inhibitors:*
atazanavir, **atazanavir/cobistat** (high alert), boceprevir, fosamprenavir, indinavir, nelfinavir, ritonavir, saquinavir, telaprevir, tipranavir

*Fusion inhibitors:*
enfuvirtide

*Miscellaneous:*
daclatasvir, dolutegravir, dolutegravir/rilpivirine, raltegravir

## Antituberculars

**ACTION:** Antituberculars act by inhibiting RNA or DNA, or interfering with lipid and protein synthesis, thereby decreasing tubercle bacilli replication.

**USES:** Antituberculars are used for pulmonary tuberculosis.

## CONTRAINDICATIONS

Persons with severe renal disease or hypersensitivity should not use these products.

**Precautions:** Antituberculars should be used with caution in pregnancy, breastfeeding, and hepatic disease.

## IMPLEMENTATION

- Give some of these agents on empty stomach, 1 hr before meals (only for isoniazid and rifampin) or 2 hr after meals
- Give antiemetic if vomiting occurs
- Give after C&S is completed; monthly to detect resistance

**ADVERSE EFFECTS:** Adverse effects vary widely among products. Most products can cause nausea, vomiting, anorexia, and rash. Serious adverse reactions include renal failure, nephrotoxicity, ototoxicity, and hepatic necrosis.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver and excreted in urine.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

## NURSING CONSIDERATIONS

### Assessment

- Assess for signs of anemia: Hct, Hgb, fatigue
- Monitor hepatic function tests weekly: ALT, AST, bilirubin
- Monitor renal status before treatment and monthly thereafter: BUN, creatinine, output, specific gravity, urinalysis
- Monitor hepatic status: decreased appetite, jaundice, dark urine, fatigue

### Patient/family education

- Teach patient that compliance with dosage schedule, duration is necessary
- Teach patient that scheduled appointments must be kept; relapse may occur
- Advise patient to avoid alcohol while taking product
- Advise patient to report flulike symptoms: excessive fatigue, anorexia, vomiting, sore throat; unusual bleeding, yellowish discoloration of skin/eyes

### Evaluation

#### Positive therapeutic outcome

- Decreased symptoms of TB
- Negative culture

**Generic Names**
ethambutol, isoniazid, pyrazinamide, rifabutin, rifampin, streptomycin

# Antitussives/Expectorants

**ACTION:** Antitussives suppress the cough reflex by direct action on the cough center in the medulla. Expectorants act by liquefying and reducing the viscosity of thick, tenacious secretions.

**USES:** Antitussives/expectorants are used to treat cough occurring in pneumonia, bronchitis, TB, cystic fibrosis, and emphysema; as an adjunct in atelectasis (expectorants); and for nonproductive cough (antitussives).

## CONTRAINDICATIONS

Some products are contraindicated in pregnancy, breastfeeding, and hypothyroidism

**Precautions:** Some products should be used cautiously with asthma and in geriatric and debilitated patients.

## IMPLEMENTATION

- Give decreased dosage to geriatric patients; their metabolism may be slowed
- Increase fluids to liquefy secretions
- Humidify patient's room

**ADVERSE EFFECTS:** The most common side effects are drowsiness, dizziness, and nausea.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Some products are metabolized in the liver and excreted in urine.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

## NURSING CONSIDERATIONS

### Assessment

- Assess cough: type, frequency, character including sputum

### Patient/family education

- Advise patient to avoid driving and other hazardous activities until stabilized on this medication
- Caution patient to avoid smoking, smoke-filled rooms, perfumes, dust, environmental pollutants, cleaners that increase cough

### Evaluation

#### Positive therapeutic outcome

- Absence of cough

**Generic Names**
acetylcysteine, codeine, dextromethorphan, diphenhydrAMINE, guaiFENesin, HYDROcodone

## Antivirals

**ACTION:** Antivirals act by interfering with DNA synthesis that is needed for viral replication.

**USES:** Antivirals are used for mucocutaneous herpes simplex virus, herpes genitalis (HSV-1, HSV-2), varicella infections, herpes zoster, and herpes simplex encephalitis.

### CONTRAINDICATIONS
Persons with hypersensitivity or immunosuppressed individuals should not use these products.

**Precautions:** Antivirals should be used cautiously in pregnancy, breastfeeding, and renal/hepatic disease.

### IMPLEMENTATION
- Give increased fluids to 3 L/day to decrease crystalluria when given **IV**
- Store at room temperature for up to 12 hr after reconstitution

**ADVERSE EFFECTS:** The most common side effects are nausea, vomiting, anorexia, headache, and diarrhea. The most serious adverse reactions are nephrotoxicity and blood dyscrasias.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized by the liver and excreted by the kidneys.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

### NURSING CONSIDERATIONS
#### Assessment
- Monitor for signs of infection, anemia
- Monitor patients with a compromised renal system; since product is excreted slowly in poor renal system function, toxicity may occur rapidly
- Monitor renal function tests: urinalysis, BUN, serum creatinine or decreased CCr may indicate nephrotoxicity; I&O ratio; report hematuria, oliguria, fatigue, weakness; check for protein in the urine during treatment
- Assess C&S before treatment; agent may be given as soon as culture is taken; repeat C&S after treatment
- Monitor bowel pattern before, during treatment; if severe abdominal pain with bleeding occurs, agent should be discontinued
- Monitor skin reactions: rash, urticaria, itching
- Monitor hepatic function tests: AST, ALT
- Monitor blood tests: WBC, RBC, Hct, Hgb, bleeding time; blood dyscrasias

#### Patient/family education
- Instruct patient to report sore throat, fever, fatigue; may indicate superinfection
- Caution patient that product does not prevent infecting others or cure condition but controls symptoms
- Instruct patient that product must be taken around the clock in equal intervals to maintain blood levels for duration of therapy
- Instruct patient to notify prescriber of side effects such as bruising, bleeding, fatigue, malaise; may indicate blood dyscrasias

#### Evaluation
**Positive therapeutic outcome**
- Absence or control of infection

**Generic Names**
acyclovir, amantadine, cidofovir, daclatasvir, docosanol, entecavir, famciclovir, foscarnet, ganciclovir, lamiVUDine, maraviroc, oseltamivir, penciclovir, rapivab, ribavirin, simeprevir, sofosbuvir, valACYclovir, valGANciclovir, zanamivir

## β-adrenergic Blockers

**ACTION:** β-blockers are divided into selective and nonselective blockers. Selective β-blockers competitively block stimulation of $\beta_1$-receptors in cardiac smooth muscle; these products produce chronotropic and inotropic effects. Nonselective blockers produce a fall in blood pressure without reflex tachycardia or reduction in heart rate through a mixture of β-blocking effects; elevated plasma renins are reduced.

**USES:** β-blockers are used for hypertension, ventricular dysrhythmias, and prophylaxis of angina pectoris.

### CONTRAINDICATIONS
Hypersensitive reactions may occur, and allergies should be identified before these products are given. β-adrenergic blockers should not be used in heart block, HF, or cardiogenic shock.

**Precautions:** β-blockers should be used with caution in pregnant and geriatric patients or in renal/thyroid disease, COPD, CAD, diabetes mellitus, and asthma.

### IMPLEMENTATION
- Give PO before meals and at bedtime; tab may be crushed or swallowed whole
- Give reduced dosage in renal dysfunction

**ADVERSE EFFECTS:** The most common side effects are orthostatic hypotension, bradycardia, diarrhea, nausea, and vomiting. Serious adverse reactions include blood dyscrasias, bronchospasm, and HF.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver, with metabolites excreted in urine, bile, and feces.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

## NURSING CONSIDERATIONS

### Assessment

- Monitor renal function tests: protein, BUN, creatinine; watch for increased levels that may indicate nephrotic syndrome; obtain baselines in renal/hepatic function tests before beginning treatment
- Monitor I&O ratio, weight daily
- Monitor B/P during beginning of treatment and periodically thereafter, pulse q4hr; note rate, rhythm, quality
- Monitor apical/radial pulse before administration; notify prescriber of significant changes
- Check for edema in feet and legs daily

### Patient/family education

- Instruct patient to comply with dosage schedule, even if feeling better
- Caution patient to rise slowly to sitting or standing position to minimize orthostatic hypotension
- Advise patient to report bradycardia, dizziness, confusion, depression, fever
- Teach patient to take pulse at home; advise when to notify prescriber
- Instruct patient to comply with weight control, dietary adjustment, modified exercise program
- Advise patient to wear support hose to minimize effects of orthostatic hypotension
- Advise patient not to discontinue product abruptly; taper over 2 wk; may precipitate angina

### Evaluation

**Positive therapeutic outcome**

- Decrease in B/P in hypertension
- Decreased B/P, edema, moist crackles in HF

---

### Generic Names

*Selective $\beta_1$-receptor blockers:*
acebutolol, atenolol, esmolol, metoprolol, nebibolol

*$\beta_2$-receptor blocker:*
indacaterol

*Nonselective $\beta_1$ and $\beta_2$-blockers:*
carteolol, nadolol, propranolol, timolol

*Combined $\alpha_1$, $\beta_1$, and $\beta_2$-receptor blocker:*
labetalol

# Bone Resorption Inhibitors

**ACTION:** Bone resorption inhibitors are divided into the bisphosphonates and the selective estrogen receptor modulators. The bisphosphonates act by absorbing calcium phosphate crystals in bone and may directly block dissolution of hydroxyapatite crystals of bone, inhibiting normal and abnormal bone resorption and mineralization. Selective estrogen receptor modulators act by reducing resorption of bone and decreasing bone turnover, mediated through estrogen receptor binding.

**USES:** Bone resorption inhibitors are used for prevention and treatment of osteoporosis in postmenopausal women, treatment of Paget's disease, and treatment of osteoporosis in men.

## CONTRAINDICATIONS

Persons developing hypersensitive reactions or those with hypocalcemia should not use these products.

**Precautions:** Bone resorption inhibitors should be used cautiously in pregnancy, breastfeeding, the geriatric patient, renal/hepatic disease, and some GI disorders.

## IMPLEMENTATION

- Give for 6 months or more in Paget's disease
- Store at room temperature

**ADVERSE EFFECTS:** The most common side effects are nausea, vomiting, headache, bone pain, and rash.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are taken up by the bones and excreted by the kidneys.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

## NURSING CONSIDERATIONS

### Assessment

- Assess reason for use and expected outcome
- Monitor bone density test; hormonal status (women) before starting treatment and thereafter
- Monitor hypercalcemia: paresthesia, twitching, laryngospasm; Chvostek's, Trousseau's signs

### Patient/family education

- Instruct patient to remain upright for at least 30 min after taking to prevent esophageal irritation
- Teach patient all aspects of product usage
- Instruct patient to use weight-bearing exercise to increase bone density

### Evaluation

**Positive therapeutic outcome**

- Increase in bone mass
- Absence of fractures

### Generic Names

*Bisphosphonates:*
alendronate, etidronate, ibandronate, pamidronate, risedronate

*Selective estrogen receptor modulator:*
raloxifene

*Monoclonal antibody:*
denosumab

## Calcium Channel Blockers

**ACTION:** Calcium channel blockers inhibit calcium ion influx across the cell membrane in cardiac and vascular smooth muscle. This action produces relaxation of coronary vascular smooth muscle, dilates coronary arteries, slows SA/AV node conduction, and dilates peripheral arteries.

**USES:** Calcium channel blockers are used for chronic stable angina pectoris, vasospastic angina, dysrhythmias, hypertension, and unstable angina.

### CONTRAINDICATIONS

Persons with 2nd- or 3rd-degree heart block, sick sinus syndrome, hypotension of <90 mm Hg systolic, Wolff-Parkinson-White syndrome, or cardiogenic shock should not use these products, since worsening of those conditions may occur.

**Precautions:** HF may worsen since edema may be increased. Hypotension may worsen, since B/P is decreased. Patients with renal/hepatic disease should use these products cautiously since they are metabolized in the liver and excreted by the kidneys.

### IMPLEMENTATION

- Give PO before meals and at bedtime

**ADVERSE EFFECTS:** The most common side effects are dysrhythmias and edema. Also common are headache, fatigue, drowsiness, and flushing.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely with route of administration. Products are metabolized by the liver and excreted in the urine primarily as metabolites.

**INTERACTIONS:** Increased levels of digoxin and theophylline may occur when used with these products. Increased effects of β-blockers and antihypertensives may occur with calcium channel blockers.

### NURSING CONSIDERATIONS

#### Assessment

- Monitor cardiac system: B/P, pulse, respirations, ECG intervals (PR, QRS, QT)

#### Patient/family education

- Teach patient how to take pulse before taking product; patient should record or graph pulses to identify changes
- Advise patient to avoid hazardous activities until stabilized on this product since dizziness occurs frequently
- Inform patient of the need for compliance to all areas of medical regimen, including diet, exercise, stress reduction, and product therapy

#### Evaluation

**Positive therapeutic outcome**

- Decreased anginal pain
- Decreased B/P, dysrhythmias

### Generic Names

amLODIPine, clevidipine, **diltiazem** (high alert), felodipine, isradipine, niCARdipine, NIFEdipine, verapamil

## Cardiac Glycosides

**ACTION:** Cardiac glycosides act by inhibiting sodium and potassium ATPase and then making more calcium available to activate contracted proteins. Cardiac contractility and cardiac output are increased.

**USES:** Cardiac glycosides are used for HF, atrial fibrillation, atrial flutter, atrial tachycardia, and rapid digitalization in these disorders.

### CONTRAINDICATIONS

Hypersensitive reactions may occur, and allergies should be identified before these products are given. Also, persons with ventricular tachycardia, ventricular fibrillation, and carotid sinus syndrome should not use these products.

**Precautions:** Persons with acute MI and those who have or may develop serum potassium, calcium, or magnesium imbalances should

use these products cautiously. Also, geriatric patients and those with AV block, severe respiratory disease, hypothyroidism, or renal/hepatic disease should exercise caution when these products are prescribed.

## IMPLEMENTATION

- Give potassium supplements if ordered for potassium levels <3

**ADVERSE EFFECTS:** The most common side effects are cardiac disturbances, headache, hypotension, and GI symptoms. Also common are blurred vision and yellow-green halos.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely with the route of administration. Digitoxin is inactivated by the liver, and inactive metabolites are excreted in urine. Digoxin is excreted in urine mainly as the parent product and metabolites.

**INTERACTIONS:** Toxicity may occur when used with diuretics, succinylcholine, quiNIDine, and thioamines. Increased blood levels may occur with propantheline bromide, spironolactone, quiNIDine, verapamil, aminoglycosides (PO), amiodarone, anticholinergics, and quiNINE. Diuretics may increase toxicity.

## NURSING CONSIDERATIONS

### Assessment

- Monitor cardiac system: B/P, pulse, respirations, and increased urine output
- Monitor apical pulse for 1 min before giving product; if pulse <60, take again in 1 hr; if <60 notify prescriber
- Monitor electrolytes: potassium, sodium, chloride, calcium, magnesium; renal function tests, including BUN and creatinine; and blood tests, including AST, ALT, bilirubin
- Monitor I&O ratio, daily weights
- Monitor therapeutic product levels

### Patient/family education

- Teach patient how to take pulse before taking product; patient should record or graph pulse to identify changes
- Advise patient to avoid hazardous activities until stabilized on this product since dizziness occurs frequently
- Inform patient of the need for compliance to all areas of medical regimen, including diet, exercise, stress reduction, product therapy

### Evaluation

#### Positive therapeutic outcome

- Decreased weight, edema, pulse, respiration
- Increased urine output

**Generic Names**
**digoxin** (high alert)

# Cholinergics

**ACTION:** Cholinergics act by preventing destruction of acetylcholine, which increases concentration at sites where acetylcholine is released. This exaggerates the effects of acetylcholine and facilitates transmission of impulses across the myoneural junction. Cholinergics may also act by stimulating receptors for acetylcholine.

**USES:** Cholinergics are used for myasthenia gravis, as antagonists of nondepolarizing neuromuscular blockade, postoperative bladder distention and urinary distention, postoperative ileus.

## CONTRAINDICATIONS

Persons with obstruction of the intestine or renal system should not use these products.

**Precautions:** Caution should be used in patients with bradycardia, hypotension, seizure disorders, bronchial asthma, coronary occlusion, and hyperthyroidism, and in breastfeeding and children.

## IMPLEMENTATION

- Give only with atropine sulfate available for cholinergic crisis
- Give only after all other cholinergics have been discontinued
- Give increased dosages if tolerance occurs
- Give larger doses after exercise or fatigue
- Give on empty stomach for better absorption
- Store at room temperature

**ADVERSE EFFECTS:** The most serious adverse reactions are respiratory depression, bronchospasm, constriction, laryngospasm, respiratory arrest, convulsions, and paralysis. The most common side effects are nausea, diarrhea, and vomiting.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver and excreted in urine.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

## NURSING CONSIDERATIONS

### Assessment

- Monitor VS, respiration q8hr
- Monitor I&O ratio; check for urinary retention or incontinence

• Assess for bradycardia, hypotension, bronchospasm, headache, dizziness, seizures, respiratory depression; product should be discontinued if toxicity occurs

### Patient/family education

• Inform patient that product is not a cure; it only relieves symptoms (myasthenia gravis)
• Advise patient to carry/wear emergency ID specifying myasthenia gravis, products taken

### Evaluation

**Positive therapeutic outcome**

• Increased muscle strength, hand grasp
• Improved muscle gait
• Absence of labored breathing (if severe)

---

### Generic Names

bethanechol, physostigmine, pyridostigmine

## Cholinergic Blockers

**ACTION:** Cholinergic blockers inhibit or block acetylcholine at receptor sites in the autonomic nervous system.

**USES:** Many cholinergic blockers are used to decrease secretions before surgery, to reverse neuromuscular blockade, and to decrease motility of the GI, biliary, and urinary tracts. Other products are used for parkinsonian symptoms, including dystonia associated with neuroleptic products.

### CONTRAINDICATIONS

Hypersensitivity can occur, and allergies should be identified before administering these products. Persons with GI and GU obstruction should not use these products, since constipation and urinary retention may occur. They are also contraindicated in closed-angle glaucoma and myasthenia gravis.

**Precautions:** Caution must be used when these products are given to the geriatric patient, since metabolism is slowed. Also, persons with tachycardia or prostatic hypertrophy should use these products with caution.

### IMPLEMENTATION

• Give with food or milk to decrease GI symptoms
• Give parenteral dose with patient recumbent to prevent postural hypotension; give dose slowly, monitoring VS
• Give hard candy, gum, frequent rinsing of mouth for dryness

**ADVERSE EFFECTS:** The most common side effects are dryness of the mouth and constipation, which can be prevented by frequent rinsing of the mouth and increasing water and bulk in the diet.

**PHARMACOKINETICS:** Onset, peak, and duration vary with route.

**INTERACTIONS:** Increase in anticholinergic effect occurs when used with opioids, barbiturates, antihistamines, MAOIs, phenothiazines, amantadine.

### NURSING CONSIDERATIONS

#### Assessment

• Assess I&O ratio; be alert for urinary retention, frequency, dysuria; product should be discontinued if these occur
• Assess urinary hesitancy, retention; palpate bladder if retention occurs
• Assess constipation; increase fluids, bulk, exercise
• Assess for tolerance over long-term therapy; dosage may need to be changed
• Assess mental status: affect, mood, CNS depression, worsening of mental symptoms during early therapy

#### Patient/family education

• Caution patient to avoid driving and other hazardous activities if drowsiness occurs
• Advise patient to avoid concurrent use of cough, cold preparations with alcohol, antihistamines unless directed by prescriber
• Caution patient to use with caution in hot weather, since medication may increase susceptibility to heat stroke

#### Evaluation

**Positive therapeutic outcome**

• Absence of cramps
• Absence of EPS

---

### Generic Names

**atropine** (high alert), benztropine, glycopyrrolate, scopolamine

## Corticosteroids

**ACTION:** Corticosteroids are divided into glucocorticoids and mineralocorticoids. Glucocorticoids decrease inflammation by the suppression of migration of polymorphonuclear leukocytes, fibroblasts, increased capillary permeability, and lysosomal stabilization. They also have varied metabolic effects and modify the body's immune responses to many different stimuli. Mineralocorticoids act by increasing resorption of sodium by increasing hydrogen and potassium excretion in the distal tubule.

**USES:** Glucocorticoids are used to decrease inflammation and for immunosuppression. In addition, some products may be given for allergy, adrenal insufficiency, or cerebral edema. Mineralocorticoids are given for adrenal insufficiency or adrenogenital syndrome.

## CONTRAINDICATIONS

Hypersensitivity may occur and should be identified before administering. Since these products mask infection, they should not be used in systemic fungal infections or amebiasis. Mothers taking pharmacologic doses of corticosteroids should not breastfeed.

**Precautions:** Caution must be used when these products are prescribed for diabetic patients since hyperglycemia may occur. Also, patients with glaucoma, seizure disorders, peptic ulcer, impaired renal function, HF, hypertension, ulcerative colitis, or myasthenia gravis should be monitored closely if corticosteroids are given. Use with caution during pregnancy, in children, and in the geriatric patient.

## IMPLEMENTATION

- Give with food or milk to decrease GI symptoms
- Give single daily or alternate-day doses in the morning before 9 AM (for replacement therapy)

**ADVERSE EFFECTS:** The most common side effects include change in behavior, including insomnia and euphoria; GI irritation, including peptic ulcer; metabolic reactions, including hypokalemia, hyperglycemia, and carbohydrate intolerance; and sodium and fluid retention. Most adverse reactions are dose dependent.

**PHARMACOKINETICS:** For oral preparations the onset of action occurs between 1-2 hr, and duration can be up to 2 days, with a half-life of 2-4 days. Pharmacokinetics vary widely among products. These products cross the placenta and appear in breast milk.

**INTERACTIONS:** Decreased corticosteroid effect may occur with barbiturates, rifampin, and phenytoin; corticosteroid dosage may need to be increased. There is a possibility of GI bleeding when used with salicylates and indomethacin. Steroids may reduce salicylate levels. When using with digoxin, glycosides, potassium-depleting diuretics, and amphotericin, serum potassium levels should be monitored.

## NURSING CONSIDERATIONS

### Assessment

- Monitor potassium, blood glucose, urine glucose while on long-term therapy; hypokalemia and hyperglycemia are common
- Monitor weight daily; notify prescriber if weekly gain of >5 lb since these products alter fluid and electrolyte balance
- Assess for potassium depletion: paresthesias, fatigue, nausea, vomiting, depression, polyuria, dysrhythmias, weakness
- Assess for mental status: affect, mood, behavioral changes, aggression; if severe personality changes occur, including depression, product may need to be tapered and then discontinued
- Monitor I&O ratio; be alert for decreasing urinary output and increasing edema
- Monitor plasma cortisol levels during long-term therapy (normal level is 138-635 nmol/L when drawn at 8 AM)
- Assess for infection: increased temp, WBC, even after withdrawal of medication; product masks symptoms of infection
- Assess for adrenal insufficiency: nausea, anorexia, fatigue, dizziness, dyspnea, weakness, joint pain

### Patient/family education

- Advise patient that emergency ID as steroid user should be carried/worn
- Advise patient not to discontinue this medication abruptly; adrenal crisis can result
- Teach patient all aspects of product use, including cushingoid symptoms
- Instruct patient to take with meals or a snack
- Teach patient to avoid exposure to chickenpox or measles if taking immunosuppressives

### Evaluation

**Positive therapeutic outcome**

- Decreased inflammation

---

### Generic Names

*Glucocorticoids:*
beclomethasone, betamethasone, cortisone, dexamethasone, hydrocortisone, hydrocortisone sodium succinate, methylPREDNISolone, predniSOLONE, predniSONE, triamcinolone

# Diuretics

**ACTION:** Diuretics are divided into subgroups: thiazides and thiazidelike diuretics, loop diuretics, carbonic anhydrase inhibitors, osmotic diuretics, and potassium-sparing diuretics. Each one of these subgroups differs in its mechanism of action. Thiazides and thiazide-like diuretics increase excretion of water and sodium by inhibiting resorption in the early distal tubule. Loop diuretics inhibit resorption of sodium and chloride in the thick ascending limb of the loop of Henle. Carbonic anhydrase inhibitors increase sodium excretion by decreasing sodium-hydrogen ion

exchange throughout the renal tubule. Carbonic anhydrase inhibitors also decrease secretion of aqueous humor in the eye and thus decrease intraocular pressure. Osmotic diuretics increase the osmotic pressure of glomerular filtrate, thus decreasing net absorption of sodium. The potassium-sparing diuretics interfere with sodium resorption at the distal tubule, thus decreasing potassium excretion.

**USES:** Blood pressure is reduced in hypertension; edema is reduced in HF; intraocular pressure is decreased in glaucoma.

## CONTRAINDICATIONS

Persons with electrolyte imbalances (sodium, chloride, potassium), dehydration, or anuria should not be given these products until the problem is corrected.

**Precautions:** Caution must be used when diuretics are given to the geriatric patient, since electrolyte disturbances and dehydration can occur rapidly. Renal/hepatic disorders may cause poor metabolism and excretion of the product.

## IMPLEMENTATION

- Give in AM to avoid interference with sleep if using product as a diuretic
- Give potassium replacement if potassium is less than 3 mg/dl

**ADVERSE EFFECTS:** Hypokalemia, hyperuricemia, and hyperglycemia occur most frequently with thiazide diuretics. Aplastic anemia, blood dyscrasias, volume depletion, and dehydration may occur when thiazide-like diuretics, loop diuretics, or carbonic anhydrase inhibitors are given. Side effects and adverse reactions vary widely for the miscellaneous products.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among the different subgroups of these products.

**INTERACTIONS:** Cholestyramine and colestipol decrease the absorption of thiazide diuretics. Concurrent use of thiazides with diazoxide may increase hyperuricemia, hyperglycemia, and antihypertensive effects of thiazides. Ototoxicity may occur when loop diuretics are used with aminoglycosides. Thiazide and loop diuretics may increase therapeutic and toxic effects of lithium.

## NURSING CONSIDERATIONS

### Assessment

- Monitor weight, I&O ratio daily to determine fluid loss; check skin turgor for dehydration
- Monitor electrolytes: potassium, sodium, chloride: include BUN, blood glucose, CBC, serum creatinine, blood pH, ABGs, uric acid, calcium; electrolyte imbalances may occur quickly
- Monitor B/P with patient lying, standing; postural hypotension may occur since fluid loss occurs from intravascular spaces first
- Assess for signs of metabolic alkalosis, including drowsiness and restlessness
- Assess for signs of hypokalemia with some products: postural hypotension, malaise, fatigue, tachycardia, leg cramps, weakness

### Patient/family education

- Teach patient to take product early in the day (diuretic) to prevent nocturia

### Evaluation

#### Positive therapeutic outcome

- Improvement in edema of feet, legs, sacral area daily if medication is being used in HF
- Improvement in B/P if medication is being used as a diuretic
- Improvement in intraocular pressure if medication is being used to decrease aqueous humor in the eye

### Generic Names

*Thiazides:*
chlorothiazide, hydrochlorothiazide

*Thiazidelike:*
chlorthalidone, indapamide, metolazone

*Loop:*
bumetanide, furosemide

*Carbonic anhydrase inhibitors:*
acetaZOLAMIDE

*Potassium-sparing:*
aMILoride, spironolactone

*Osmotic:*
mannitol, urea

# Histamine $H_2$ Antagonists

**ACTION:** Histamine $H_2$ antagonists act by inhibiting histamine at $H_2$ receptor site in parietal cells, which inhibits gastric acid secretion.

**USES:** Histamine $H_2$ antagonists are used for short-term treatment of duodenal and gastric ulcers and maintenance therapy for duodenal ulcer and for gastroesophageal reflux disease.

## CONTRAINDICATIONS

Persons with hypersensitivity should not use these products.

**Precautions:** Caution should be used in pregnancy, breastfeeding, children <16 yr,

organic brain syndrome, and renal/hepatic disease.

## IMPLEMENTATION

- Give with meals for prolonged product effect
- Give antacids 1 hr before or 1 hr after cimetidine
- Give **IV** slowly; bradycardia may occur; give over 30 min
- Store diluted sol at room temperature for up to 48 hr

**ADVERSE EFFECTS:** The most serious adverse reactions are agranulocytosis, thrombocytopenia, neutropenia, aplastic anemia, and exfoliative dermatitis. The most common side effects are confusion (not with ranitidine), headache, and diarrhea.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver and excreted in urine.

**INTERACTIONS:** Antacids interfere with absorption of histamine $H_2$ antagonists. Check individual monographs for specific information.

## NURSING CONSIDERATIONS

### Assessment

- Monitor gastric pH (>5 should be maintained)
- Monitor I&O ratio, BUN, creatinine

### Patient/family education

- Advise patient that gynecomastia, impotence may occur but is reversible
- Caution patient to avoid driving and other hazardous activities until patient is stabilized on this medication
- Caution patient to avoid black pepper, caffeine, alcohol, harsh spices, extremes in temperature of food
- Caution patient to avoid OTC preparations: aspirin, cough, cold preparations
- Inform patient that product must be continued for prescribed time to be effective
- Advise patient to report bruising, fatigue, malaise; blood dyscrasias may occur

### Evaluation

**Positive therapeutic outcome**

- Decreased pain in abdomen

---

**Generic Names**
cimetidine, famotidine, ranitidine

# Immunosuppressants

**ACTION:** Immunosuppressants produce immunosuppression by inhibiting T lymphocytes.

**USES:** Most immunosuppressants are used for organ transplants to prevent rejection.

## CONTRAINDICATIONS

Products are contraindicated in hypersensitivity.

**Precautions:** Caution should be used in pregnancy and severe renal/hepatic disease.

## IMPLEMENTATION

- Give for several days before transplant surgery
- Give with meals for GI upset or place product in chocolate milk
- Give with oral antifungal for *Candida* infections

**ADVERSE EFFECTS:** The most serious adverse reactions are albuminuria, hematuria, proteinuria, renal failure, and hepatotoxicity. The most common side effects are oral *Candida* infection, gum hyperplasia, tremors, and headache. The most serious adverse reactions for azaTHIOprine are hematologic (leukopenia and thrombocytopenia) and GI (nausea and vomiting). There is a risk of secondary infection.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver and excreted in urine.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

## NURSING CONSIDERATIONS

### Assessment

- Monitor renal function tests: BUN, creatinine at least monthly during treatment, 3 mo after treatment
- Monitor hepatic function tests: alkaline phosphatase, AST, ALT, bilirubin
- Monitor product blood levels during treatment
- Assess for hepatotoxicity: dark urine, jaundice, itching, light-colored stools; product should be discontinued

### Patient/family education

- Advise patient to report fever, chills, sore throat, fatigue since serious infections may occur
- Caution patient to use contraceptive measures during treatment and for 12 wk after ending therapy

### Evaluation

**Positive therapeutic outcome**

- Absence of rejection

### Generic Names

azaTHIOprine, **basiliximab** (high alert), cycloSPORINE, everolimus, muromonab-CD3, secukinumab, sirolimus, tacrolimus, vedolizumab

## Laxatives

**ACTION:** Laxatives are divided into bulk products, lubricants, osmotics, saline laxative stimulants, and stool softeners. Bulks work by absorbing water and expanding to increase moisture content and bulk in the stool. Lubricants increase water retention in the stool, causing reabsorption of water in the bowel. Saline draws water into the intestinal lumen. Osmotics increase distention and promote peristalsis. Stimulants act by increasing peristalsis by direct effect on the intestine. Stool softeners reduce surface tension of liquid in the bowel.

**USES:** Laxatives are used as a preparation for bowel or rectal examination, for constipation, or as stool softeners.

### CONTRAINDICATIONS

Persons with GI obstruction, perforation, gastric retention, toxic colitis, megacolon, abdominal pain, nausea, vomiting, and fecal impaction should not use these products.

**Precautions:** Caution should be used in rectal bleeding, large hemorrhoids, and anal excoriation.

### IMPLEMENTATION

- Give alone only with water for better absorption; do not take within 1 hr of antacids, milk, or cimetidine
- Swallow tab whole; do not break, crush, or chew

**ADVERSE EFFECTS:** The most common side effects are nausea, abdominal cramps, and diarrhea.

**PHARMACOKINETICS:** Onset, peak, and duration vary among products.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

### NURSING CONSIDERATIONS

#### Assessment

- Monitor blood, urine electrolytes if product is used often by patient
- Monitor I&O ratio to identify fluid loss
- Determine cause of constipation; identify whether fluids, bulk, or exercise is missing from lifestyle
- Assess for cramping, rectal bleeding, nausea, vomiting; if these symptoms occur, product should be discontinued

#### Patient/family education

- Caution patient not to use laxatives for long-term therapy; bowel tone will be lost; that normal bowel movements do not always occur daily
- Caution patient not to use in presence of abdominal pain, nausea, vomiting
- Advise patient to notify prescriber of abdominal pain, nausea, vomiting
- Advise patient to notify prescriber if constipation is unrelieved or if symptoms of electrolyte imbalance occur: muscle cramps, pain, weakness, dizziness

#### Evaluation

**Positive therapeutic outcome**

- Decrease in constipation

### Generic Names

*Bulk laxative:*
psyllium

*Osmotic agent:*
lactulose

*Saline laxatives:*
magnesium salts, sodium biphosphate/sodium phosphate

*Stimulants:*
bisacodyl, senna

*Stool softener:*
docusate

## Neuromuscular Blocking Agents

**ACTION:** Neuromuscular blocking agents are divided into depolarizing and nondepolarizing blockers. They act by inhibiting transmission of nerve impulses by binding with cholinergic receptor sites.

**USES:** Neuromuscular blocking agents are used to facilitate endotracheal intubation and skeletal muscle relaxation during mechanical ventilation, surgery, or general anesthesia.

### CONTRAINDICATIONS

Persons who are hypersensitive should not be given this product.

**Precautions:** Caution should be used in pregnancy, breastfeeding, children <2 yr, thyroid disease, collagen disease, cardiac disease, electrolyte imbalances, dehydration, neuromuscular

disease (myasthenia gravis), and respiratory disease.

### IMPLEMENTATION

- Administer using nerve stimulator by anesthesiologist to determine neuromuscular blockade
- Administer anticholinesterase to reverse neuromuscular blockade
- Give **IV** undiluted over 1-2 min (only by qualified person, usually an anesthesiologist)
- Store in light-resistant, cool area
- Reassure patient if communication is difficult during recovery from neuromuscular blockade

**ADVERSE EFFECTS:** The most serious adverse reactions are prolonged apnea, bronchospasm, cyanosis, respiratory depression, and malignant hyperthermia. The most common side effects are bradycardia and decreased motility.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver and excreted in urine.

**INTERACTIONS:** Aminoglycosides potentiate neuromuscular blockade. Check individual monographs for specific information.

### NURSING CONSIDERATIONS

#### Assessment

- Monitor for electrolyte imbalances (potassium, magnesium); may lead to increased action of this product
- Monitor VS (B/P, pulse, respirations, airway) q15min until fully recovered; rate, depth, pattern of respirations, strength of hand grip
- Monitor I&O ratio; check for urinary retention, frequency, hesitancy
- Assess for recovery: decreased paralysis of face, diaphragm, leg, arm, rest of body
- Assess for allergic reactions: rash, fever, respiratory distress, pruritus; product should be discontinued

#### Evaluation

**Positive therapeutic outcome**

- Paralysis of jaw, eyelid, head, neck, rest of body

---

#### Generic Names

**pancuronium** (high alert), **succinylcholine** (high alert), **vecuronium** (high alert)

## Nonsteroidal Antiinflammatories

**ACTION:** Nonsteroidal antiinflammatories decrease prostaglandin synthesis by inhibiting an enzyme needed for biosynthesis.

**USES:** Nonsteroidal antiinflammatories are used to treat mild to moderate pain, osteoarthritis, rheumatoid arthritis, and dysmenorrhea.

### CONTRAINDICATIONS

Persons with hypersensitivity, asthma, or severe renal/hepatic disease should not use these products.

**Precautions:** Caution should be used in pregnancy, breastfeeding, children, geriatric patients, bleeding/GI/cardiac disorders, and hypersensitivity to other antiinflammatory agents.

### IMPLEMENTATION

- Give with food to decrease GI symptoms; however, best to take on empty stomach to facilitate absorption
- Store at room temperature

**ADVERSE EFFECTS:** The most serious adverse reactions are nephrotoxicity (dysuria, hematuria, oliguria, azotemia), blood dyscrasias, and cholestatic hepatitis. The most common side effects are nausea, abdominal pain, anorexia, dizziness, and drowsiness.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver and excreted in urine.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

### NURSING CONSIDERATIONS

#### Assessment

- Monitor renal, hepatic, blood tests: BUN, creatinine, AST, ALT, Hgb, before treatment, periodically thereafter
- Monitor audiometric, ophth examination before, during, and after treatment.
- Check for eye, ear problems: blurred vision, tinnitus; may indicate toxicity

#### Patient/family education

- Advise patient to report blurred vision, ringing, roaring in ears; may indicate toxicity
- Caution patient to avoid driving, other hazardous activities if dizziness, drowsiness occurs, especially in geriatric patients
- Advise patient to report change in urine pattern, increased weight, edema, increased pain in

joints, fever, blood in urine; indicate nephrotoxicity
• Inform patient that therapeutic effects may take up to 1 mo to occur

### Evaluation

**Positive therapeutic outcome**
• Decreased pain, stiffness in joints
• Decreased swelling in joints
• Ability to move more easily

---

### Generic Names

celecoxib, diclofenac, etodolac, ibuprofen, indomethacin, ketoprofen, ketorolac, nabumetone, naproxen, piroxicam, sulindac

## Opioid Analgesics

**ACTION:** These agents depress pain impulse transmission at the spinal cord level by interacting with opioid receptors. Products are divided into opiates and nonopiates.

**USES:** Most opioid analgesics are used to control moderate to severe pain and are used before and after surgery.

### CONTRAINDICATIONS

Hypersensitive reactions occur frequently. Check for sensitivity before administering. These products should not be used if opioid addiction is suspected.

**Precautions:** Caution must be used when these products are given to persons with an addictive personality, since the possibility of addiction is so great. Also, persons with increased ICP may experience an even greater increase in ICP. Persons with severe heart disease, renal/hepatic disease, respiratory conditions, and seizure disorders should be monitored closely for worsening condition.

### IMPLEMENTATION

• Give with antiemetic if nausea or vomiting occurs
• Give when pain is beginning to return; determine dosage interval by patient response
• Provide assistance with ambulation; patient should not be ambulating during product peak

**ADVERSE EFFECTS:** GI symptoms, including nausea, vomiting, anorexia, constipation, and cramps are the most common side effects. Other common side effects include lightheadedness, dizziness, and sedation. Serious adverse reactions such as respiratory depression, respiratory arrest, circulatory depression, and increased ICP may result but are less common and usually dose dependent.

**PHARMACOKINETICS:** Onset of action is immediate by **IV** route and rapid by IM and PO routes. Peak occurs from 1-2 hr, depending on route, with a duration of 2-8 hr. These agents cross the placenta and appear in breast milk.

**INTERACTIONS:** Barbiturates, other opioids, hypnotics, antipsychotics, or alcohol can increase CNS depression when taken with opioids.

### NURSING CONSIDERATIONS

#### Assessment

• Monitor I&O ratio; be alert for urinary retention, frequency, dysuria; product should be discontinued if these occur
• Assess for respiratory dysfunction: respiratory depression, rate, rhythm, character; notify prescriber if respirations are <12/min
• Assess for CNS changes: dizziness, drowsiness, hallucinations, euphoria, LOC, pupil reaction
• Assess for allergic reactions: rash, urticaria
• Assess for need for pain medication, use pain scoring

#### Patient/family education

• Advise patient to report any symptoms of CNS changes, allergic reactions, or shortness of breath
• Caution patient that physical dependency may result when used for extended periods
• Teach patient that withdrawal symptoms may occur, including nausea, vomiting, cramps, fever, faintness, anorexia
• Advise patient to avoid alcohol and other CNS depressants

#### Evaluation

**Positive therapeutic outcome**
• Decrease in pain

---

### Generic Names

buprenorphine, butorphanol, codeine, **fentaNYL** (high alert), fentaNYL transdermal, **HYDROmorphone** (high alert), **meperidine** (high alert), **methadone** (high alert), **morphine** (high alert), nalbuphine, **oxyCODONE** (high alert), **oxymorphone** (high alert), **pentazocine** (high alert), **remifentanil** (high alert)

## Salicylates

**ACTION:** Salicylates have analgesic, antipyretic, and antiinflammatory effects. The analgesic and antiinflammatory activities may be mediated through the inhibition of prostaglandin

synthesis. Antipyretic action results from inhibition of the hypothalamic heat-regulating center.

**USES:** The primary uses of salicylates are relief of mild to moderate pain and fever and in inflammatory conditions such as arthritis, thromboembolic disorders, and rheumatic fever.

## CONTRAINDICATIONS

Hypersensitivity to salicylates is common. Check for sensitivity before administering. Persons with bleeding disorders, GI bleeding, and vit K deficiency should not use these products since salicylates increase pro-time. Children should not use these products since salicylates have been associated with Reye's syndrome.

**Precautions:** Caution is needed when salicylates are given to patients with anemia, renal/hepatic disease, and Hodgkin's disease. Caution should also be exercised in pregnancy and breastfeeding.

## IMPLEMENTATION

- Give with food or milk to decrease gastric irritation; give 30 min before or 1 hr after meals with a full glass of water

**ADVERSE EFFECTS:** The most common side effects are GI symptoms and rash. Serious blood dyscrasias and hepatotoxicity may result when used for long periods at high doses. Tinnitus or impaired hearing may indicate that blood salicylate levels are reaching or exceeding the upper limit of the therapeutic range.

**PHARMACOKINETICS:** Onset of action occurs in 15-30 min, with a peak of 1-2 hr and a duration up to 6 hr. These products are metabolized by the liver and excreted by the kidneys.

**INTERACTIONS:** Increased effects of anticoagulants, insulin, methotrexate, heparin, valproic acid, and oral sulfonylureas may occur when used with salicylates. Aspirin may decrease serum concentrations of nonsteroidal antiinflammatory agents.

## NURSING CONSIDERATIONS

### Assessment

- Monitor renal/hepatic function tests: AST, ALT, bilirubin, creatinine, LDH, alkaline phosphatase, BUN if patient is on long-term therapy since these products are metabolized and excreted by the liver and kidney
- Monitor blood tests: CBC, Hct, Hgb, and pro-time if patient is on long-term therapy, since these products increase the possibility of bleeding and blood dyscrasias
- Assess for hepatotoxicity: dark urine, clay-colored stools, jaundiced skin and sclera, itching, abdominal pain, fever, diarrhea, which may occur with long-term use
- Assess for ototoxicity: tinnitus, ringing, roaring in ears; audiometric testing is needed before and after long-term therapy

### Patient/family education

- Advise patient that blood sugar levels should be monitored closely if patient is diabetic
- Caution patient not to exceed recommended dosage; acute poisoning may result
- Inform patient that therapeutic response takes 2 wk in arthritis
- Caution patient to avoid use of alcohol since GI bleeding may result
- Advise patient to notify prescriber if ringing in the ears or persistent GI pain occurs
- Advise patient to take with full glass of water to reduce risk of lodging in esophagus

### Evaluation

**Positive therapeutic outcome**

- Decreased pain, fever

---

### Generic Names

aspirin, magnesium salicylate, salsalate

# Sedatives/Hypnotics

**ACTION:** The sedatives/hypnotics depress the CNS; some products at the cerebral cortex, others inhibit transmitters in the CNS.

**USES:** Sedatives/hypnotics are used for the treatment of sleep disorders, seizures, muscle spasms, and alcohol withdrawal.

## CONTRAINDICATIONS

Persons with hypersensitivity reactions should not use these products.

**Precautions:** Sedatives/hypnotics should be used cautiously in pregnancy and breastfeeding.

## IMPLEMENTATION

- Give lowest possible dose for therapeutic result; adjust dose to response
- Provide assistance with ambulation during beginning therapy if dizziness, ataxia occur

**ADVERSE EFFECTS:** The most common side effects are nausea and drowsiness. The most serious side effects are Stevens-Johnson syndrome, blood dyscrasias, and risk of dependency.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver and excreted by the kidneys.

**INTERACTIONS:** Increased CNS depression may occur with other CNS depressants such as alcohol, opiates, antipsychotics, and antidepressants.

## NURSING CONSIDERATIONS

### Assessment

- Monitor mental status: affect, mood, behavioral changes, depression, confusion; seizure activity

### Patient/family education

- Inform patient that these products should only be used for short-term insomnia
- Caution patient not to drive or engage in other hazardous activities while taking these products
- Instruct patient to avoid breastfeeding while taking these products
- Instruct patient to avoid alcohol or other CNS depressants as drowsiness will increase
- Teach patient that some of the products take two nights to be effective
- Advise patient to report side effects, adverse reactions to health care provider
- Instruct patient to use exactly as prescribed, at regular intervals

### Evaluation

**Positive therapeutic outcome**

- Ability to sleep throughout the night
- Absence or decreasing seizure activity

### Generic Names

*Barbiturates:*
**PHENobarbital** (high alert)

*Benzodiazepines:*
chlordiazePOXIDE, clorazepate, diazepam, flurazepam, LORazepam, midazolam, oxazepam, temazepam, triazolam

*Miscellaneous products:*
chloral hydrate, dexmedetomidine, **droperidol** (high alert), eszopiclone, hydrOXYzine, promethazine, ramelteon, suvorexant, tasimelton, zaleplon, zolpidem

# Skeletal Muscle Relaxants

**ACTION:** Most skeletal muscle relaxants inhibit synaptic responses in the CNS by stimulating receptors and decreasing neurotransmission, decreasing pain and spasticity.

**USES:** Skeletal muscle relaxants are used for musculoskeletal disorders with pain or spasticity related to spinal cord injuries.

## CONTRAINDICATIONS

Persons with hypersensitivity should not use these products.

**Precautions:** Skeletal muscle relaxants should be used cautiously in pregnancy, breastfeeding, the geriatric patient, peptic ulcer, renal/hepatic disease, stroke, seizure disorder, and diabetes.

## IMPLEMENTATION

- Give when pain is beginning to return, not after pain is severe
- Store in dry area, away from heat and sunlight

**ADVERSE EFFECTS:** The most common side effects are dizziness, weakness, fatigue, drowsiness, and headache. Some products can cause seizures, cardiovascular collapse, and severe CNS depression.

**PHARMACOKINETICS:** Pharmacokinetics vary widely among products. Check individual monographs for specific information.

**INTERACTIONS:** CNS depressants used with skeletal muscle relaxants may lead to increased CNS depression.

## NURSING CONSIDERATIONS

### Assessment

- Monitor pain: character, location, duration, alleviating/aggravating factors

### Patient/family education

- Advise patient not to use with other CNS depressant unless prescriber approved
- Inform patient that many products require 1-2 mo of treatment for full effect
- Caution patient to avoid hazardous activities until response to medication is known
- Caution patient that most products should not be discontinued quickly, but tapered over 1-2 wk

### Evaluation

**Positive therapeutic outcome**

- Decrease in pain or spasticity

### Generic Names

*Centrally acting:*
baclofen, carisoprodol, cyclobenzaprine, diazepam, methocarbamol

*Direct-acting:*
dantrolene

# Thrombolytics

**ACTION:** Thrombolytics activate conversion of plasminogen to plasmin (fibrinolysin). Plasmin is able to break down clots (fibrin).

**USES:** Thrombolytics are used to treat DVT, PE, arterial thrombosis, arterial embolism, arteriovenous cannula occlusion, lysis of coronary artery thrombi after MI, and acute evolving transmural MI.

## CONTRAINDICATIONS

Persons with hypersensitivity, active bleeding, intraspinal surgery, neoplasms of the CNS, ulcerative colitis/enteritis, severe hypertension, renal/hepatic disease, hypocoagulation, COPD, subacute bacterial endocarditis, rheumatic valvular disease, cerebral embolism/thrombosis/hemorrhage, intra-arterial diagnostic procedure or surgery (10 days), and recent major surgery should not use these products.

**Precautions:** Caution should be used in arterial emboli from left side of heart and pregnancy.

## IMPLEMENTATION

- Administer as soon as thrombi identified; not useful for thrombi over 1wk old
- Administer cryoprecipitate or fresh, frozen plasma if bleeding occurs
- Give loading dose at beginning of therapy; may require increased loading doses
- Give heparin after fibrinogen level is over 100 mg/dl; heparin INF to increase PTT to 1.5-2 × baseline for 3-7 days
- About 10% of patients have high streptococcal antibody titers requiring increased loading doses
- Give **IV** therapy using 0.8-μm filter
- Store reconstituted sol in refrigerator; discard after 24 hr
- Provide bed rest during entire course of treatment

**ADVERSE EFFECTS:** Serious adverse reactions include GI, GU, intracranial, and retroperitoneal bleeding and anaphylaxis. The most common side effects are decreased Hct, urticaria, headache, and nausea.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver and excreted in urine.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

## NURSING CONSIDERATIONS

### Assessment

- Monitor VS, B/P, pulse, respirations, neurologic signs, temp at least q4hr (increased temp is an indicator of internal bleeding), cardiac rhythm following intracoronary administration; systolic pressure increase of >25 mm Hg should be reported to prescriber
- Assess for neurologic changes that may indicate intracranial bleeding
- Assess retroperitoneal bleeding: back pain, leg weakness, diminished pulses
- Assess for allergy: fever, rash, itching, chills; mild reaction may be treated with antihistamines
- Assess for bleeding during 1st hr of treatment: hematuria, hematemesis, bleeding from mucous membranes, epistaxis, ecchymosis
- Monitor blood tests (Hct, platelets, PTT, PT, TT, APTT) before starting therapy; PT or APTT must be less than 2 times control before starting therapy; TT or PT q3-4hr during treatment

### Patient/family education

- Teach patient to avoid venous or arterial puncture, injection, rectal temp
- Teach patient to treat fever with acetaminophen or aspirin
- Teach patient to apply pressure for 30 sec to minor bleeding sites; inform prescriber if this does not attain hemostasis; apply pressure dressing

### Evaluation

**Positive therapeutic outcome**

- Resolution of thrombosis, embolism

---

### Generic Names

**alteplase** (high alert), drotrecogin alfa, **tenecteplase** (high alert), **urokinase** (high alert)

# Thyroid Hormones

**ACTION:** Thyroid hormones increase metabolic rates, resulting in increased cardiac output, $O_2$ consumption, body temp, blood volume, growth, development at cellular level, respiratory rate, and enzyme system activity.

**USES:** Thyroid hormones are used for thyroid replacement.

## CONTRAINDICATIONS

Persons with adrenal insufficiency, myocardial infarction, or thyrotoxicosis should not use these products.

**Precautions:** Caution should be used in pregnancy and breastfeeding. Geriatric patients and those with angina pectoris, hypertension, ischemia, cardiac disease, or diabetes mellitus or insipidus should be watched closely when using these products.

## IMPLEMENTATION

- Give at same time each day to maintain product level
- Give only for hormone imbalances; not to be used for obesity, male infertility, menstrual conditions, lethargy
- Remove medication 4 wk before RAIU test

**ADVERSE EFFECTS:** The most common side effects include insomnia, tremors, tachycardia, palpitations, angina, dysrhythmias, weight loss, and changes in appetite. Serious adverse reactions include thyroid storm.

**PHARMACOKINETICS:** Pharmacokinetics vary widely among products. Check individual monographs for specific information.

## INTERACTIONS

- Impaired absorption of thyroid products may occur when administered with cholestyramine, iron products (separate by 4-5 hr).
- Increased effects of anticoagulants, sympathomimetics, tricyclics, catecholamines may occur.
- Decreased effects of digoxin, glycosides, insulin, hypoglycemics may occur.
- Decreased effects of thyroid products may occur with estrogens.

## NURSING CONSIDERATIONS

### Assessment

- Monitor B/P, pulse before each dose
- Monitor I&O ratio
- Monitor weight daily in same clothing, using same scale, at same time of day
- Monitor height, growth rate if given to a child
- Monitor $T_3$, $T_4$, which are decreased; radioimmunoassay of TSH, which is increased; ratio uptake, which is decreased if patient is on too low a dosage of medication
- Assess for increased nervousness, excitability, irritability; may indicate too high a dosage of medication, usually after 1-3 wk of treatment
- Assess for cardiac status: angina, palpitation, chest pain, change in VS

### Patient/family education

- Advise patient/family that hair loss will occur in children and is temporary
- Advise patient to report excitability, irritability, anxiety; indicates overdose
- Caution patient not to switch brands unless directed by prescriber
- Caution family that hypothyroid children will show almost immediate behavior/personality change
- Advise patient that treatment product is not to be taken to reduce weight
- Advise patient to avoid OTC preparations with iodine; read labels; to avoid iodine-containing foods: iodized salt, soybeans, tofu, turnips, some seafood, some bread

### Evaluation

#### Positive therapeutic outcome

- Absence of depression
- Increased weight loss, diuresis, pulse, appetite
- Absence of constipation, peripheral edema, cold intolerance, pale, cool, dry skin, brittle nails, alopecia, coarse hair, menorrhagia, night blindness, paresthesias, syncope, stupor, coma, rosy cheeks

### Generic Names

levothyroxine, liothyronine ($T_3$), liotrix, thyroid USP

# Vasodilators

**ACTION:** Vasodilators act in various ways. Check individual monographs for specific action.

**USES:** Vasodilators are used to treat intermittent claudication, arteriosclerosis obliterans, vasospasm and muscular ischemia, ischemic cerebral vascular disease, hypertension, and angina.

## CONTRAINDICATIONS

Some products are contraindicated in acute MI, paroxysmal tachycardia, and thyrotoxicosis.

**Precautions:** Caution should be used in uncompensated heart disease or peptic ulcer disease.

## IMPLEMENTATION

- Give with meals to reduce GI symptoms
- Store in tight container at room temperature

**ADVERSE EFFECTS:** The most common side effects are headache, nausea, hypotension, hypertension, and ECG changes.

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Most products are metabolized in the liver and excreted in urine.

**INTERACTIONS:** Interactions vary widely among products. Check individual monographs for specific information.

## NURSING CONSIDERATIONS

### Assessment

- Assess bleeding time in individuals with bleeding disorders
- Assess cardiac status: B/P, pulse, rate, rhythm, character; watch for increasing pulse

### Patient/family education

- Inform patient that medication is not cure, may need to be taken continuously
- Advise patient that it is necessary to quit smoking to prevent excessive vasoconstriction
- Advise patient that improvement may be sudden, but usually occurs gradually over several weeks

• Instruct patient to report headache, weakness, increased pulse, since product may need to be decreased or discontinued
• Instruct patient to avoid hazardous activities until stabilized on medication; dizziness may occur

### Evaluation

**Positive therapeutic outcome**
• Ability to walk without pain
• Increased temp in extremities
• Increased pulse volume

### Generic Names
amyl nitrite, bosentan, dipyridamole, hydrALAZINE, minoxidil, nesiritide

## Vitamins

**ACTION:** The action of vitamins varies widely among products and classes. Check individual monographs for specific action.

**USES:** Vitamins are used to correct and prevent vitamin deficiencies.

**CONTRAINDICATIONS**
Hypersensitive reactions may occur, and allergies should be identified before these products are given.

**IMPLEMENTATION**
• Give PO with food for better absorption
• Store in tight, light-resistant container

**ADVERSE EFFECTS:** There is an absence of side effects or adverse reactions with the water-soluble vitamins (C, B). However, fat-soluble vitamins (A, D, E, K) may accumulate in the body and cause adverse reactions (refer to individual monographs).

**PHARMACOKINETICS:** Onset, peak, and duration vary widely among products. Check individual monographs for specific information.

**NURSING CONSIDERATIONS**

### Patient/family education
• Advise patient not to take more than prescribed amount

### Evaluation

**Positive therapeutic outcome**
• Absence of vitamin deficiency

### Generic Names
*Fat-soluble:*
phytonadione (vitamin $K_1$), vitamin A, vitamin D, vitamin E

*Water-soluble:*
ascorbic acid (C), cyanocobalamin ($B_{12}$), pyridoxine ($B_6$), riboflavin ($B_2$), thiamine ($B_1$)

*Miscellaneous:*
multivitamins

# Appendix A

## Selected New Drugs

### abaloparatide (Rx)

**Tymlos**

*Func. class.:* Parathyroid hormone analog and modifier

**ACTION:** A synthetic peptide analog of a parathyroid hormone–related protein that acts as an agonist at the PTH receptors. Therapeutic outcome: Increased bone mineral density

**USES:** For the treatment of postmenopausal women with osteoporosis at high risk for fracture

### CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Breastfeeding, children, pregnancy, radiation, hypercalcemia, hypercalciuria, hyperuricemia, hyperparathyroidism, renal disease, orthostatic hypotension

**BLACK BOX WARNING:** Osteogenic sarcoma; cumulative use of abaloparatide or other parathyroid hormone analogs for more than 2 yr during a patient's lifetime is not recommended

### DOSAGE AND ROUTES

**For the treatment of postmenopausal women with osteoporosis at high risk for fracture**

**Adult postmenopausal female:** SUBCUT 80 mcg qday

**Available forms:** Solution for injection 80 mcg (pen)

#### Implementation

**SUBCUT route**

- Visually inspect for particulate matter and discoloration before use
- Do not use IV/IM; needles are not included with the pen. A separate prescription will be needed for the needles. The correct needles to use with the pen are 8-mm, 31-gauge, Clickfine needles, such as ReliOn, Smart Sense, or TopCare brands
- *Storage:* Before the first use, store the pen in the refrigerator (do not freeze). After the first use, store for up to 30 days at room temperature between 68 and 77° F (20 and 25° C); do not freeze or expose it to heat. Keep the cap on when not in use. Do not store with a needle attached. Use the pen only for 30 days. Properly dispose
- Place the capped needle straight onto the pen. A click will be heard when attached
- Pull off the outer pen needle cap from the pen needle and keep it to recap the needle after the injection; pull off the inner pen needle cap and dispose of it
- Prime before the first use, which removes air bubbles
- Turn the dose knob on the pen away from you (clockwise) until it stops. You will see "80" lined up in the dose display window
- Hold the pen with the pen needle pointing up. Tap lightly with your finger on the cartridge holder to move any air bubbles in the cartridge to the top of the cartridge
- Press the green injection button until it will not go any farther. You will see "0" lined up in the dose display window. A drop of liquid should come out of the needle tip. If not, repeat the priming steps
- Set the patient's dose on the pen by turning the dose knob on the pen away from you (clockwise) until the dose knob stops and "80" is lined up in the dose display window
- Choose and clean an injection site in the periumbilical region of the abdomen. Avoid the 2-inch area around the navel. Do not inject into areas where the skin is tender, bruised, red, scaly, or hard. Avoid areas with scars or stretch marks
- Insert the pen needle straight into the patient's skin
- Press the green injection button on the pen until it cannot go any farther and "0" is in the dose display window. Do not move the pen after inserting the needle
- Continue to press the green injection button while counting to 10. Counting to 10 will allow the full dose to be given
- After counting to 10, release the green injection button and slowly remove the pen from the injection site by pulling the pen needle straight out
- Place the outer needle cap back on the pen needle. Press on the outer needle cap until it snaps into place

• Unscrew the used, capped needle from the pen. To unscrew the capped needle, you may need to turn it 8 or more turns and then pull until the capped needle comes off. Properly dispose of the used needle
• Firmly replace the pen cap onto the pen. Keep the pen cap on the pen for storage between injections
• Rotate site daily and give the same time daily
• The first several doses should be given with the patient lying down in case of orthostatic hypotension

## ADVERSE EFFECTS

**CNS:** Dizziness

**META:** Hypercalcemia, hyperuricemia

**INTEG:** Injection site reactions

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding is approximately 70% |
| **Half-life** | 0.7 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset, peak, duration** | Unknown |

## INTERACTIONS

None known

## NURSING CONSIDERATIONS

### Assessment

• Osteoporosis: Assess for before and during treatment
• Blood studies: Monitor serum calcium, uric acid baseline and periodically
• Pregnancy/breastfeeding not indicated for women of reproductive potential

### Patient/family education

• Advise patient not try to inject until they or their caregiver receives training
• Teach patient that they should receive the first several injections where they can sit or lie down until they know how it affects them
• Advise patient to inject 1 time each day into the lower stomach area (abdomen) just under the skin (subcutaneous). Avoid giving the injection within the 2-inch area around the belly button (navel), rotate injection sites daily
• Advise patient to take at same time each day; if they forget or cannot take at the usual time, take it as soon as remembered on that day
• Teach patient not to share pen or pen needles with other people, even if the needle has been changed

### Evaluation

**Positive therapeutic outcome**

• Prevention of fractures in postmenopausal osteoporosis

# abemaciclib

uh-beh′-muh-sy′-klib)

**Verzenio**

*Func. class.:* Antineoplastic

*Chem. class.:* Protein kinase inhibitors

**ACTION:** It is an inhibitor of the cyclin-dependent kinases 4 and 6. It is a protein kinase inhibitor

**USES:** For the treatment of HR-positive, HER2-negative advanced or metastatic breast cancer with disease progression after endocrine therapy and before chemotherapy in the metastatic setting, as monotherapy or in combination with fulvestrant

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Breastfeeding, contraception requirements, hepatic disease, hepatotoxicity, infertility, neutropenia, pregnancy, pregnancy testing, reproductive risk, thromboembolic disease

## DOSAGE AND ROUTES

**For the treatment of HR-positive, HER2-negative advanced or metastatic breast cancer with disease progression after endocrine therapy and before chemotherapy in the metastatic setting, as monotherapy**

**Adult: PO** 200 mg bid until disease progression or unacceptable toxicity.

**For the treatment of HR-positive, HER2-negative advanced or metastatic breast cancer with disease progression after endocrine therapy in combination with fulvestrant**

**Adult: PO** 150 mg bid with fulvestrant (500 mg IM as two 250-mg [5 ml] injections, 1 injection in each buttock, on days 1, 15, 29, and every month thereafter) until disease progression or unacceptable toxicity. Pre- and perimenopausal women should also be treated with a gonadotropin-releasing hormone agonist

**Available forms:** Tabs 50, 100, 150, 200 mg

### Therapeutic drug monitoring

**Dosage adjustments for treatment-related toxicities:**

Interrupt therapy per specific instructions. Restart as appropriate at the following reduced doses: *Starting dose:* **Monotherapy**, 200 mg bid; **combination with fulvestrant**, 150 mg

bid; ***First occurrence:*** Monotherapy, 150 mg bid; **combination with fulvestrant**, 100 mg bid; ***Second occurrence:*** Monotherapy, 100 mg bid; combination with fulvestrant, 50 mg bid; ***Third occurrence:*** Monotherapy, 50 mg bid; combination with fulvestrant, not applicable

**Diarrhea:** ***Grade 1***: Begin antidiarrheals, increase oral fluid intake. No change needed; ***Grade 2, first occurrence:*** Begin antidiarrheals, increase oral fluid intake. If diarrhea does not resolve to grade 1 or less within 24 hr, hold therapy until resolution. No change needed unless grade 2 diarrhea persists; upon resolution to grade 1 or less, resume at the next lower dose level***; Grade 2, recurrent despite maximal supportive measures***: Begin antidiarrheals, increase oral fluid intake. When diarrhea resolves to grade 1 or less, resume at the next lower dose level; ***Grade 3 or 4, or requires hospitalization:*** Begin antidiarrheals, increase oral fluid intake. When diarrhea resolves to less than or equal to grade 1, resume at the next lower dose level

**Hematologic toxicities:** ***Grade 3, first occurrence***: Hold, when the toxicity resolves to grade 2 or less, resume; dose reduction is not needed unless growth factor was needed. If treatment with growth factor is needed, additionally wait for at least 48 hr after the last dose of growth factor before resuming at the next lower dose level; ***Grade 3, recurrent, or grade 4:*** Hold, when the toxicity resolves to grade 2 or less, resume at the next lower dose level If treatment with growth factor is needed, additionally wait for at least 48 hr after the last dose of growth factor before resuming

### Hepatic dose

**Adult:** PO *Child-Pugh A or B:* No change: *Child-Pugh C:* Reduce dosing to once per day; *Grade 1 (AST/ALT 1.1 to 3 times the upper limit of normal [ULN[), without an increase in total bilirubin above 2 times ULN:* No change; *Grade 2, first occurrence (AST/ALT 3.1 to 5 times ULN), without an increase in total bilirubin above 2 times ULN:* No change; if grade 2 persists, hold; after resolution to baseline or grade 1, resume at the next lower dose level; *Grade 2, recurrent (AST/ALT 3.1 to 5 times ULN), without an increase in total bilirubin above 2 times ULN:* Hold. after resolution to baseline or grade 1, resume at the next lower dose level; *Grade 2 or 3 (AST/ALT 3.1 to 20 times ULN) with total bilirubin greater than 2 times ULN, in the absence of cholestasis:* Discontinue*; Grade 4 (AST/ALT greater than 20 times ULN):* Discontinue

**Implementation:** Take with food at the same time every day

- Swallow tablets whole; do not chew, crush, or split. Not to take if broken, cracked
- If a dose is missed, do not replace the missed dose. Resume with the next scheduled daily dose

## ADVERSE EFFECTS

**CNS:** Dizziness, drowsiness, fatigue, fever, headache

**GI:** *Diarrhea, abdominal pain, anorexia, nausea, vomiting, constipation, stomatitis, weight loss, decreased appetite*

**GU:** Renal failure (rare)

**HEMA:** Anemia, leukemia, neutropenia, thrombocytopenia

**INTEG:** *Rash, alopecia*

**MS:** Arthralgia

**MISC:** Infection

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 96.3% |
| **Metabolism** | Metabolized in the liver by CYP3A4 |
| **Excretion** | Feces |
| **Half-Life:** | 18.3 hr, half-life fecal excretion 97.1% |

### Pharmacodynamics

| | |
|---|---|
| **Onset, Peak, Duration** | Unknown |

## INTERACTIONS

Strong or moderate CYP3A4 inhibitors: Increased abemaciclib effect, avoid concomitant use

Strong or moderate CYP3A4 inducers: Decreased abemaciclib effect, avoid concomitant use

## NURSING CONSIDERATIONS

### Assessment

- **Diarrhea**: Assess for diarrhea, at the first sign of loose stools antidiarrheal therapy should be started, increase oral fluids
- **Neutropenia:** Obtain CBC baseline, then q2wk for the first 2 mo, then monthly for the next 2 mo, and as needed
- **Thromboembolism:** Monitor patients for signs and symptoms of thrombosis and pulmonary embolism and treat as needed; **PE:** Chest pain, worse when breathing deeply or cough, coughing, coughing up blood, dizziness, fainting, tachypnea, rapid heartbeat, irregular

heartbeat, shortness of breath; **thrombosis:** Pain, swelling of the affected extremity/area with erythema and warmth over the vicinity of the clot, discoloration including a bluish or suffused color, positive Homan's sign: pain with dorsiflexion of the foot; pain on palpation, presence of a palpable cord

- **Hepatotoxicity:** Increases in LFTs may occur, monitor LFTs baseline, then q2wk for the first 2 mo, then monthly for the next 2 mo, and as needed
- Infection: May occur, assess for urinary tract infection, lung infection, pharyngitis, conjunctivitis, sinusitis, vaginal infection, sepsis
- **Pregnancy/breastfeeding:** Avoid by females of reproductive potential during treatment and for at least 3 wk after the last dose, can cause fetal harm or death when used during pregnancy; discontinue breastfeeding during treatment and for 3 wk after the final dose. It is not known whether present in breast milk. Obtain a pregnancy test before starting treatment

### Patient/family education

- **Infection:** May occur; teach patient to report urinary pain, hesitancy, increased temperature, fever, shaking, chills, cough, sore throat, sinus pain; report to health care provider
- **Diarrhea**: Teach patient, at the first sign of loose stools to start antidiarrheal therapy, increase fluids, and notify their healthcare provider
- **Thromboembolism:** Teach patient to report immediately chest pain, worse when breathing deeply or cough, coughing, coughing up blood, dizziness, fainting, tachypnea, rapid heartbeat, irregular heartbeat. shortness of breath; pain, swelling of the extremity with redness and warmth discoloration including a bluish color
- **Pregnancy/breastfeeding:** Teach patient product is not to be used in pregnancy, breastfeeding, contraception should be used during and for at 3 wk after last dose

### Evaluation

**Positive therapeutic outcome**

- Decrease in size of cancerous tumor

**RARELY USED**

**⚠ HIGH ALERT**

## acalabrutinib

**Calquence**

*Func. class.:* Antineoplastic

**USES:** For the treatment of mantle cell lymphoma

## DOSAGE AND ROUTES

**For the treatment of mantle cell lymphoma (MCL) in patients who have received at least 1 prior therapy**

**Adult:** PO 100 mg bid (approximately 12 hr apart) until disease progression.

**⚠ HIGH ALERT**

**RARELY USED**

## alectinib

(al-ek'ti-nib)

**Alecensa**

*Func. class.:* Antineoplastics

**USES:** Anaplastic lymphoma kinase (ALK)–positive metastatic non-small cell lung cancer that has progressed or is intolerant to crizotinib

## CONTRAINDICATIONS

Hypersensitivity

## DOSAGE AND ROUTES

**Adult:** PO 600 mg bid, with food, until disease progression or unacceptable toxicity

**⚠ HIGH ALERT**

## avelumab

a-vel'ue-mab)

**Bavencio**

*Func. class.:* Antineoplastic monoclonal antibody

*Chem. class.:* Human IgG1 monoclonal antibody

**ACTION:** A human IgG1 monoclonal antibody that binds to the programmed death ligand found on T cells and blocks the interaction on receptors on the tumor cell

**USES:** For the treatment of Merkel cell carcinoma

## CONTRAINDICATIONS

Pregnancy, hypersensitivity

**Precautions:** Adrenal insufficiency, autoimmune disease, breastfeeding, colitis, Crohn's disease, contraception requirements, diabetes mellitus, diarrhea, hepatic disease, hepatitis, hyperglycemia, infertility, infection, infusion-related reactions, organ transplant, pulmonary disease, pneumonitis, reproductive risk, thyroid disease

## DOSAGE AND ROUTES

### For the treatment of metastatic Merkel cell carcinoma

**Adult, Adolescent, and Child > 12 yr of age:** IV 10 mg/kg IV over 60 min q2wk until disease progression. Give antihistamine (diphenhydramine) and acetaminophen 30 to 60 min before the first 4 infusions; premedication may be administered before subsequent doses as necessary

### For the treatment of locally advanced or metastatic urothelial carcinoma, in patients with disease progression on or after platinum-containing chemotherapy, or within 12 mo of neoadjuvant or adjuvant platinum-containing chemotherapy

**Adult:** IV 10 mg/kg IV over 60 min q2wk until disease progression or unacceptable toxicity. Give antihistamine (diphenhydramine) and acetaminophen 30 to 60 min before the first 4 infusions; premedication may be administered before subsequent doses as necessary

### Management of treatment-related toxicity

**Immune-mediated reactions**

**Colitis:** *Grade 2 or 3 toxicity:* Hold and give corticosteroids (predniSONE 1 to 2 mg/kg/day or equivalent, then taper); resume therapy when the adverse event recovers to grade 1 or less after the corticosteroid taper; permanently discontinue if grade 3 toxicity occurs or recurs. *Grade 4 toxicity:* Permanently discontinue, give corticosteroids (predniSONE 1 to 2 mg/kg/day or equivalent, then taper)

**Endocrinopathies (including hyperglycemia, hypothyroidism, hyperthyroidism, adrenal insufficiency):** *Grade 3 or 4 toxicity:* Hold, give corticosteroids and manage the endocrinopathy with the following: insulin or antihyperglycemics for hyperglycemia, hormone replacement therapy for hypothyroidism; resume, when the adverse event recovers to grade 1 or less after the corticosteroid taper

**Hepatitis:** *Grade 2 toxicity (AST or ALT level of 3 to 5 times the upper limit of normal [ULN] or a total bilirubin level of 1.5 to 3 times the ULN):* Hold, give corticosteroids (predniSONE 1 to 2 mg/kg/day equivalent initially, then taper); resume when the adverse event recovers to grade 1 or less after the corticosteroid taper. *Grade 3 or 4 toxicity (AST or ALT level greater than 5 times the ULN or a total bilirubin level greater than 3 times the ULN):* Permanently discontinue, give corticosteroids (predniSONE 1 to 2 mg/kg/day or equivalent initially, then taper).

**Nephritis:** *Grade 2 or 3 toxicity (serum creatinine [SCr] level of 1.5- to 6-times the ULN):* Hold, give corticosteroids predniSONE 1 to 2 mg/kg/day or equivalent initially, then taper); resume therapy when the adverse event recovers to grade 1 or less after the corticosteroid taper. *Grade 4 toxicity (SCr level greater than 6-times the ULN):* Permanently discontinue, give corticosteroids (predniSONE 1 to 2 mg/kg/day or equivalent initially then taper).

**Pneumonitis:** *Grade 2 toxicity:* Hold, give corticosteroids (predniSONE 1 to 2 mg/kg/day or equivalent initially, then taper); resume when the adverse event recovers to grade 1 or less after the corticosteroid taper; permanently discontinue if grade 2 toxicity occurs or recurs. *Grade 3 or 4 toxicity:* Permanently discontinue, give corticosteroids (predniSONE 1 to 2 mg/kg/day or equivalent initially, then taper).

**Other immune-mediated adverse reactions (including myocarditis, myositis, psoriasis, arthritis, exfoliative dermatitis, erythema multiforme, pemphigoid, hypopituitarism, uveitis, Guillain-Barre syndrome, bullous rash/dermatitis, Stevens-Johnson syndrome/toxic epidermal necrolysis, pancreatitis, rhabdomyolysis, myasthenia gravis, histiocytic necrotizing lymphadenitis, demyelination, vasculitis, hemolytic anemia, hypophysitis, iritis, and encephalitis):** *Grade 2 or 3 toxicity:* Hold, give corticosteroids (predniSONE 1 to 2 mg/kg/day or equivalent initially) and hormone replacement therapy if indicated. When the adverse event recovers to grade 1 or less, begin a corticosteroid taper. Resume if the adverse event remains at grade 1 or less after the corticosteroid taper. Permanently discontinue if grade 3 toxicity occurs recurs, the corticosteroid dose remains at 10 mg/day or greater of predniSONE (or equivalent) for longer than 12 wk, or for persistent grade 2 or 3 immune-mediate adverse reactions lasting 12 wk or longer. *Grade 4 toxicity (excluding endocrinopathies):* Permanently discontinue, give corticosteroids (predniSONE 1 to 2 mg/kg/day or equivalent initially)

**Infusion-related reactions:** *Grade 1 or 2 toxicity:* Temporarily hold or slow the infusion. *Grade 3 or 4 toxicity:* Permanently discontinue. Available forms: Solution for injection 200 mg/10 ml

### Implementation

**IV route**

- Visually inspect for particulate matter and discoloration before use

### Dilution

- Add the required amount/volume of drug to a 250-ml bag of 0.9% sodium chloride injection or 0.45% sodium chloride injection; mix by gentle inversion
- Discard any unused drug left in the vial
- *Storage after dilution:* Store at room temperature (up to 25° C or 77° F) for up to 4 hr or refrigerated (2 to 8° C; 36 to 46° F) for up to 24 hr from the time of dilution. Do not freeze or shake; protect from light. If refrigerated, allow the diluted solution to warm to room temperature before use

### Intermittent IV infusion

- Administer the diluted solution IV over 60 min
- Use a sterile, nonpyrogenic, low-protein-binding, 0.2-micron inline filter
- Do not administer other drugs through the same infusion line
- Follow cytotoxic handling procedures

## ADVERSE EFFECTS

**CNS:** Fatigue, chills, fever, dizziness, headache, flushing

**GI:** Nausea, vomiting, diarrhea, constipation, abdominal pain, anorexia

**HEMA:** Anemia, thrombocytopenia, lymphopenia

**INTEG:** Urticaria

**MS:** Back pain, arthralgia, myalgia

**Pharmacokinetics**

| | |
|---|---|
| **Half-life** | 6.1 days, steady state 4-6 wk |

## INTERACTIONS

None known

## NURSING CONSIDERATIONS

### Assessment

- **Serious infection:** Some may be fatal. Monitor patients for signs and symptoms of infection; hold therapy for grade 3 or higher infection. Serious *Pneumocystis jiroveci* pneumonia (PJP) has occurred; consider PJP prophylaxis in at-risk patients before starting treatment, hold if PJP is suspected. If PJP diagnosis is confirmed, treat the infection until resolution and then resume at the previous dose and give PJP prophylaxis for the duration of therapy
- **Myelosuppression:** Assess for anemia, thrombocytopenia, neutropenia; obtain a CBC at least weekly during treatment
- **Pregnancy/breastfeeding:** Product can cause fetal harm; females of reproductive potential should avoid becoming pregnant while taking this product, do not breastfeed during and for at least 1 mo after the last dose

### Patient/family education

- Teach patient to report adverse reactions immediately, report diarrhea, flu-like symptoms
- Teach patient about reason for treatment, expected results
- **Pregnancy/breastfeeding:** Advise patient to notify provider if pregnancy is planned or suspected, to use effective contraception during treatment and up to 30 days after discontinuing treatment, not to use during pregnancy, breastfeeding, and for at least 1 mo after last dose

### Evaluation

**Positive therapeutic outcome**

Improving blood counts

## axicabtagene ciloleucel

(ax-i-cab'tay-jeen-sye-lo'loo-sel)

**Yescarta**

*Func. class.:* Antineoplastic, cellular immunotherapies

*Chem. class.:* Chimeric antigen receptor (CAR) T-cell therapy

## ACTION:

A chimeric antigen receptor (CAR) T-cell therapy that works by redirecting T cells to target an antigen on B cells in patients with hematologic malignancies.

## USES:

For the treatment of non-Hodgkin's lymphoma (NHL)

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Neurotoxicity, allergic reactions, anemia, neutropenia, thrombocytopenia, secondary malignancy, hypogammaglobulinemia, B-cell aplasia, pregnancy, breastfeeding, hepatitis B, vaccinations, infection

**BLACK BOX WARNING:** Cytokine release syndrome

## DOSAGE AND ROUTES

**For the treatment of relapsed or refractory large B-cell lymphoma (diffuse large B-cell lymphoma [DLBCL] not otherwise specified, primary mediastinal large B-cell lymphoma, high-grade B-cell lymphoma, and DLBCL arising from follicular lymphoma) after 2 or more lines of systemic therapy**

**Adult:** IV $2 \times 10^6$ CAR-positive viable T cells per kg of body weight (max dose of $2 \times 10^8$ CAR-positive viable T-cells) as a single IV dose

## Therapeutic drug monitoring

### Management of treatment-related toxicity

**Cytokine release syndrome (CRS) (without concurrent neurologic toxicity):** For ≥ grade 2 toxicity, give tocilizumab 8 mg/kg IV over 1 hr (max 800 mg); repeat tocilizumab 8 mg/kg IV q8hr as needed if IV fluids or supplemental oxygen is not effective. Max 3 doses/24 hr, or max 4 doses. ***Grade 2 toxicity (oxygen requirement <40% $FiO_2$, hypotension responsive to fluids or a low dose of 1 vasopressor agent, or grade 2 organ toxicity):*** No improvement within 24 hr after starting tocilizumab, start methylprednisolone 1 mg/kg IV bid or dexamethasone 10 mg IV q6hr, continue corticosteroids until the toxicity resolves to ≤ grade 1, then taper over 3 days. ***Grade 3 toxicity (oxygen requirement of ≥ 40% FiO2, hypotension requiring high-dose or multiple vasopressor agents, grade 3 organ toxicity, or grade 4 transaminitis):*** Start methylprednisolone 1 mg/kg IV bid or dexamethasone 10 mg IV q6hr; continue corticosteroids until the toxicity resolves to ≤ grade 1, then taper over 3 days. ***Grade 4 toxicity (i.e., requirements for ventilator support, continuous venovenous hemodialysis [CVVHD], or grade 4 organ toxicity (excluding transaminitis):*** Give methylprednisolone 1000 mg IV/day for 3 days. If the condition improves, begin methylprednisolone 1 mg/kg IV bid or dexamethasone 10 mg IV q6hr. Continue corticosteroids until the toxicity resolves to ≤ grade 1, then taper over 3 days

**Neurologic toxicity (without concurrent CRS):** Consider seizure prophylaxis with a nonsedating antiseizure medication. ***Grade 2 toxicity:*** Start dexamethasone 10 mg IV q6hr until the toxicity resolves to ≤ grade 1, then taper over 3 days. ***Grade 3 toxicity:*** Start dexamethasone 10 mg IV q6hr until the toxicity resolves to ≤ grade 1, then taper over 3 days. ***Grade 4 toxicity:*** Give methylprednisolone 1000 mg IV daily for 3 days. If condition improves, begin dexamethasone 10 mg IV q6hr. Continue corticosteroids until the toxicity resolves to ≤ grade 1, then taper over 3 days.

**Neurologic toxicity with concurrent CRS:** May use seizure prophylaxis with a nonsedating antiseizure medication. For grade 2 or higher CRS, give tocilizumab 8 mg/kg IV over 1 hr (max dose, 800 mg); may repeat tocilizumab 8 mg/kg IV q8hr as needed, max 3 doses/24 hr or max 4 doses. ***Grade 2 neurotoxicity:*** If no improvement in 24 hr after starting tocilizumab, start dexamethasone 10 mg IV q6hr (if not already taking other corticosteroids); continue corticosteroids until the toxicity resolves to ≤ 1, then taper over 3 days. ***Grade 3 neurotoxicity:*** Give dexamethasone 10 mg IV q6hr; start with the first dose of tocilizumab. Continue corticosteroids until the toxicity resolves to ≤ grade 1, then taper over 3 days. ***Grade 4 neurotoxicity:*** Give methylprednisolone 1000 mg IV daily for 3 days; start with the first dose of tocilizumab. If the condition improves, start dexamethasone 10 mg IV q6hr. Continue corticosteroids until the toxicity resolves to ≤ grade 1, then taper over 3 days.

## Implementation

### IV route

- Premedicate patients with acetaminophen 650 mg and diphenhydramine 12.5 mg IV or PO 1 hr before use
- Confirm that tocilizumab is available at the facility before the infusion
- Visually inspect the infusion bag for any breaks or cracks before thawing. Do not infuse if the bag is compromised; follow local guidelines or call Kite Pharma at 844-454-5483
- For autologous and IV use
- Each dose contains a max of $2 \times 10^8$ CAR-positive viable T cells suspended in a single patient-specific infusion bag; the total infusion bag volume is about 68 ml
- Ensure tocilizumab and emergency equipment are available before use
- Coordinate the timing of the product's thaw and infusion; confirm the infusion time in advance, and adjust the start time for thaw so that the patient will be ready
- Premedicate with acetaminophen and diphenhydramine approximately 1 hr before the infusion; avoid corticosteroid use except in the case of a life-threatening emergency

## Preparation

- Match the patient's identity with the patient identifiers on the cassette; do not remove the product bag from the cassette if the patient-specific label does not match the intended recipient
- Remove the product bag from the cassette; verify that the patient information on the cassette label matches the bag label
- Put the infusion bag inside a second, sterile bag to protect against leaks and port contamination
- Thaw the infusion bag at 37° Celsius (C) using a water bath or dry thaw method; once there is no visible ice, gently mix the contents of the bag

• If visible cell clumps remain, continue to gently mix; small clumps should disperse
• Do not wash, spin down, and/or resuspend in new media before use
• ***Storage***: After thawing, may store at room temperature (20 to 25° C) ≤ 3 hr

**Intravenous (IV) infusion**

• Confirm the patient's identity with the patient identifiers on the infusion bag
• Prime the tubing with normal saline before use; do not use a leukocyte-depleting filter
  • Give as an IV infusion within 30 min via gravity or a peristaltic pump until the infusion bag is empty
  • Gently agitate during the infusion to prevent cell clumping
  • Rinse the tubing with normal saline at the same infusion rate to ensure all product is given

## ADVERSE EFFECTS

**CNS:** Confusion, chills, delirium, dizziness, drowsiness, fatigue, fever, hallucinations, irritability, malaise, neurotoxicity, paranoia, tremor, weakness

**CV:** Atrial fibrillation/flutter, AV block, bundle branch block, orthostatic hypotension, QT prolongation, sinus tachycardia, supraventricular tachycardia, ventricular tachycardia, hypotension

**GI:** Abdominal pain, nausea, vomiting, anorexia, constipation, diarrhea, weight loss

**HEMA:** Anemia, leukopenia, lymphopenia, neutropenia, thrombocytopenia, thromboembolism, thrombosis

**META:** Hypokalemia, hyponatremia, hypophosphatemia, hyperuricemia

### Pharmacokinetics

| | |
|---|---|
| **Absorption, distribution, metabolism, excretion** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset, duration** | Unknown |
| **Peak** | 7-14 days |

## INTERACTIONS

None known

## NURSING CONSIDERATIONS

### Assessment

• **Allergic reactions, anaphylaxis:** Premedicate acetaminophen and diphenhydramine before use. Use with caution in those with DMSO, aminoglycoside hypersensitivity
• **Cytopenias (anemia, neutropenia, and thrombocytopenia):** Monitor complete blood counts regularly until recovery
• **Secondary malignancy:** Lifelong monitoring for the development of secondary malignancies is recommended. Report cases of secondary malignancy to Kite at 844-454-5483; instructions will be provided regarding patient sample collection for testing
• **Hypogammaglobulinemia and B-cell aplasia:** Monitor immunoglobulin levels after therapy; provide infection precautions, antibiotic therapy, and immunoglobulin replacement as required
• **Hepatitis B virus (HBV) reactivation:** May cause hepatitis B exacerbation, fulminant hepatitis, hepatic failure, and death; may occur with drugs directed against B cells. Screen all patients for HBV, hepatitis C virus, and HIV before cell collection (leukapheresis)
• **Serious infections (bacterial, fungal, viral):** Some may be life threatening or fatal. Monitor for infection before and after use; antiinfective therapy should be used as needed. Febrile neutropenia has also been reported; it may occur concurrently with cytokine release syndrome, assess for infection and give broad-spectrum antibiotics, fluids as needed
• Patients should avoid cell, organ, tissue, and blood donation
• **Pregnancy/breastfeeding:** Should be avoided, there are not any studies available, pregnancy testing is needed before starting treatment, contraception should be used during treatment, but length of time after treatment concludes is unknown; avoid breastfeeding, excretion is unknown

**BLACK BOX WARNING: Cytokine release syndrome (CRS)** may be fatal or life threatening. Do not use in active infection or inflammatory disorders. Confirm that 2 tocilizumab doses are available before infusion. Observe for CRS qday for ≥ 7 days in a certified facility after the infusion, continue monitoring for ≥ 4 wk after the infusion. Assess for fever, hypoxia, and hypotension. Treat severe or life-threatening CRS with tocilizumab or tocilizumab and corticosteroids. Those with mild symptoms (fever, nausea, fatigue, headache, myalgia, and malaise) may require symptomatic treatment only. Monitor patients with grade 2 or higher CRS (hypotension, not responsive to fluids, or hypoxia requiring supplemental oxygenation) with continuous cardiac telemetry and pulse oximetry. Possible ECG to assess cardiac function. Axicabtagene ciloleucel is available only through a restricted program under a Risk Evaluation and Mitigation Strategy (REMS) called the YESCARTA REMS

• **Severe neurotoxicity** (encephalopathy, seizures, cerebral edema) some fatal, usually occurs within 8 wk. Assess for neurotoxicity daily ≥ 7 days in a certified healthcare facility after infusion and for ≥ 4 wk after the infusion. Monitor those with grade 2 or higher neurotoxicity with continuous cardiac telemetry and pulse oximetry. Nonsedating, antiseizure medicines (levetiracetam) may be required for seizure prophylaxis

### Patient/family education

• Advise patient to avoid driving, operating machinery, or performing other dangerous duties for 8 wk after treatment, mental status changes, seizures may occur or change in consciousness or coordination
• Do not donate blood, organs, tissues
• Teach patient to report fever, fast heartbeat, confusion, inability to speak to healthcare provider
• Advise patient to avoid vaccinations (live virus) during and for 6 wk after treatment

### Evaluation

**Positive therapeutic outcome**
• Prevention of spread of cancer

**⚠ HIGH ALERT**

## betrixaban (Rx)

(be-trix'-a-ban)
**Bevyxxa**
*Func. class.:* Antithrombotic agent
*Chem. class.:* Synthetic, selective factor Xa inhibitor

**ACTION:** Inhibits factor Xa; neutralization of factor Xa interrupts blood coagulation and thrombin formation

**USES:** Prevention/treatment of deep venous thrombosis, PE at-risk, acutely ill, hospitalized medical patients

## CONTRAINDICATIONS

Hypersensitivity, active major bleeding

**Precautions:** Pregnancy, breastfeeding, children, geriatric patients, hepatic disease, renal disease

**BLACK BOX WARNING:** Spinal/epidural anesthesia, lumbar puncture

## DOSAGE AND ROUTES

**For venous thromboembolism prophylaxis (i.e., deep venous thrombosis [DVT] prophylaxis, pulmonary embolism prophylaxis) in at-risk, acutely ill, hospitalized medical patients**

**Adult: PO** 160 mg once, followed by 80 mg qday for 35 to 42 days

### Implementation

• Give capsules with food
• If a dose is not taken at the scheduled time, the dose should be taken as soon as possible on the same day. Do not take a double dose

## ADVERSE EFFECTS

**CNS:** Headache

**GI:** Nausea, constipation, diarrhea

**HEMA:** Bleeding, major bleeding (intracranial, cerebral, retroperitoneal hemorrhage)

**META:** Hypokalemia

**EENT:** Ocular hemorrhage

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 60% |
| **Metabolism** | Affected cytochrome P450 isoenzymes and drug transporters: P-gp, betrixaban is a substrate of P-glycoprotein (P-gp) |
| **Excretion** | 85% of the dose is recovered in the feces and 11% in the urine |
| **Half-life** | 19 to 27 hr |

## INTERACTIONS

### Drug classifications

Salicylates, NSAIDs: Increased bleeding risk

### Individual drugs

Abciximab, eptifibatide, tirofiban, clopidogrel, dipyridamole, quiNIDine, valproic acid: Increased bleeding risk

### Drug/herb

Feverfew, garlic, ginger, ginkgo, ginseng, green tea, horse chestnut, kava: Increased bleeding risk

## NURSING CONSIDERATIONS

### Assessment

**BLACK BOX WARNING:** Monitor patients who have received epidural/spinal anesthesia or lumbar puncture for neurologic impairment, including spinal hematoma; may lead to permanent disability or paralysis

• Assess for bleeding: Gums, petechiae, ecchymosis, black tarry stools, hematuria; decreased Hct, notify prescriber
• Assess for risk of hemorrhage if coadministering with other products that may cause bleeding
• Assess for hypersensitivity: Rash, fever, chills; notify prescriber
• **Beers:** Avoid in older adults; increased risk of bleeding, lower creatinine clearance

### Patient/family education

• Teach patient to use soft-bristle toothbrush to avoid bleeding gums; to use electric razor
• Advise patient to report any signs of bleeding: Gums, under skin, urine, stools
• Advise patient to avoid OTC products containing aspirin, NSAIDs

### Evaluation

**Positive therapeutic outcome**
• Prevention of DVT

## brexpiprazole

(brex-pip'-ra-zole)
**Rexulti**
*Func. class.:* Antipsychotic, atypical

**ACTION:** Although the exact mechanism of action is unknown, may exert its effects through a combination of partial agonist activity at dopaminergic D-2 receptors and serotonergic 5-HT1A receptors and antagonist activity at serotonergic 5-HT2A receptors

**USES:** Adjunctive treatment of major depressive disorder, schizophrenia

## CONTRAINDICATIONS

Hypersensitivity

## DOSAGE AND ROUTES

### For the treatment of schizophrenia

**Adult:** PO Initially, 1 mg qday, on Day 5, increase to 2 mg qday, on Day 8, may increase to 4 mg qday based on response and tolerability. The recommended dose range is 2 to 4 mg/day (max: 4 mg/day)

### For the adjunctive treatment of major depression

**Adult:** PO initially, 0.5 to 1 mg qday, after titration to 1 mg/day, increase to the target dose of 2 mg qday, titrate dosage at weekly intervals based on response and tolerability

### Hepatic dose

**Adult:** PO Mild hepatic impairment: No change, moderate to severe hepatic impairment (Child-Pugh score 7 or more): Max 2 mg qday for major depression and 3 mg qday for schizophrenia

### Renal dose

**Adult:** PO CCr ≥ 60 ml/min: No change; CCr <60 ml/min, including end-stage renal disease (ESRD): Max is 2 mg qday for major depression and 3 mg qday for schizophrenia

**Available forms: Tablet:** 0.25, 0.50, 1, 2, 3, 4 mg

### Implementation

• Initiate treatment at the low end of the dosage range in geriatric adults
• Coadministration of certain drugs may need to be avoided or dosage adjustments may be necessary; review drug interactions. In those who are poor metabolizers (PMs) of CYP2D6 (CYP2D6 PMs), give one half of the usual dose. In those who are CYP2D6 PMs and receiving a moderate or strong CYP3A4 inhibitor, give one quarter of the usual. If the coadministered drug is discontinued, adjust the dose accordingly for those who are CYP2D6 PMs. Periodically reassess for need of continued maintenance therapy
• Without regard to food

## ADVERSE EFFECTS

**CNS:** Akathisia, fatigue, drowsiness, dizziness, tremor, sedation, insomnia, EPS

**EENT:** Blurred vision, dry mouth, nasopharyngitis

**GI:** Constipation, diarrhea, nausea, flatulence, abdominal cramping/pain

**GU:** UTI

**MISC:** Weight gain, myalgia

### Pharmacokinetics

| | |
|---|---|
| **Half-life** | 91 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 4 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Anticholinergics: Increased temperature
Other CNS depressants: Increased CNS depression
Strong CYP2D6 inhibitors, strong CYP3A4 inhibitors: Increased brexpiprazole effect

### Drug/herb

Decrease: Brexpiprazole effect: St. John's wort, may need to increase product dose

### Drug/food

Increase: Brexpiprazole effect: Grapefruit juice, avoiding using together

### Drug/lab test

## NURSING CONSIDERATIONS

### Assessment

• **Hypersensitivity:** Do not use in hypersensitivity, rash, facial swelling, urticaria, and anaphylaxis have been observed; discontinue immediately

**BLACK BOX WARNING: Suicidal ideation:** Provide close supervision and control, patient should receive the smallest quantity consistent with good management in order to reduce the risk of overdose. In those who exhibit changes in symptoms, worsening of depression, suicidality, or other unusual changes in mood or behaviors, a decision should be made to change or discontinue treatment. If discontinuing, the medication should be tapered as rapidly as possible, but with recognition that abrupt discontinuation of the drug can also cause adverse symptoms. Children and young adults < 24 yr are at increased risk

• **Tardive dyskinesia:** Periodic evaluation for movement disorders is recommended (AIMS). If signs and symptoms of tardive dyskinesia appear, discontinuation should be considered

• **Seizure disorder**: Use cautiously in patients with seizures, a history of seizure disorder, or with conditions that potentially lower the seizure threshold. Conditions that lower the seizure threshold may be more prevalent in elderly patients who are 65 yr or older

• **Orthostatic hypotension**: Monitor for dizziness, lightheadedness, and tachycardia and occasionally syncope. These risks are greatest at the beginning of treatment and during dose escalation. May be at increased risk include those with dehydration, hypovolemia, treatment with antihypertensive medications, history of cardiac disease (heart failure, myocardial infarction, coronary artery disease, ischemia, or conduction abnormalities), history of cerebrovascular disease, and those patients who are antipsychotic-naive. Elderly patients may be at higher risk for syncope and cardiovascular and cerebrovascular events. In at-risk patients, consider using a lower starting dosage and slower titration, and monitor orthostatic vital signs, such as heart rate and blood pressure. A fall risk assessment should be completed recurrently in at-risk patients on long-term antipsychotic therapy

• **Hematological disease:** Those with a history of clinically significant low WBC count or drug-induced leukopenia/neutropenia should have frequent complete blood count (CBC) assessments during the first few months of treatment. Discontinuation should be considered if a clinically significant decline in WBC occurs in the absence of an identifiable cause. Patients with clinically significant neutropenia should be closely monitored for fever and infection, and appropriate medical intervention should be instituted if necessary. Discontinue in patients with severe neutropenia (ANC < 1000/mm$^3$)

• **Pregnancy/breastfeeding:** No well-controlled studies, only use when benefits outweigh the fetal risks. Neonates exposed to antipsychotics during the third trimester of pregnancy are at risk for extrapyramidal and/or withdrawal symptoms after delivery. Enroll patient at The National Pregnancy Registry for Psychiatric Medications at https://womensmentalhealth.org/clinical-and-research-programs/pregnancyregistry or by phone 866-961-2388. It is not known if antipsychotics, through their effect on prolactin, would affect labor or delivery; consider the benefits of breastfeeding, the risk of potential infant drug exposure, and the risk of an untreated or inadequately treated condition. If a breastfeeding infant experiences an adverse effect related to a maternally ingested drug, healthcare providers are encouraged to report the adverse effect to the FDA

### Patient/family education

• Advise patient to use caution when driving or operating machinery or performing other tasks that require mental alertness until they know how the drug affects them. Patients should also be advised to avoid ethanol ingestion during treatment. Somnolence from antipsychotic use could lead to falls with the potential for fractures and other injuries

### Evaluation

**Positive therapeutic outcome:**

• Decreased depression

**RARELY USED**

**⚠ HIGH ALERT**

## brigatinib

(bri-ga'-ti-nib)

**Alunbrig**

*Func. class.:* Antineoplastic

**USES:** For the treatment of advanced ALK-positive metastatic non-small cell lung cancer that has progressed on or is intolerant to crizotinib

## DOSAGES AND ROUTES

**Adult:** PO 90 mg qday × 7 days, if tolerated during the first 7 days, increase to 180 mg qday. Continue until disease progression or unacceptable toxicity

**⚠ HIGH ALERT**

# brivaracetam

(briv-a-ra'se-tam)

**Briviact**

*Func. class.:* Anticonvulsant

## ACTION

The exact mechanism not known, may occur in modulation of synaptic vesicle proteins, additional anticonvulsant activity may be related to the modulation of voltage-dependent sodium channels

## USES

For the adjunctive treatment of partial seizures

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Abrupt discontinuation, breastfeeding, depression, driving or operating machinery, geriatric, hepatic disease, pregnancy, suicidal ideation

## DOSAGE AND ROUTES

**Adult and Adolescent 16 yr and older:** PO/IV 50 mg bid. Adjust dose to 25 mg bid IV or 100 mg bid based on clinical response; max 100 mg bid. Use IV when PO is temporarily not feasible

**Available forms:** Tabs 10, 25, 50, 75, 100; oral solution 10 mg/ml; solution for injection 50 mg/5 ml (10 mg/ml)

### Implementation

- May be administered without regard to meals
- To discontinue, gradually reduce the dose to minimize the risk for increased seizure frequency and status epilepticus

**Tablets:** Swallow tablets whole; do not crush or chew

**Oral solution:**

- No dilution is necessary
- Measure and administer the oral solution using a calibrated measuring device
- A nasogastric tube or gastrostomy tube may be used for administration
- **Storage:** Discard any unused solution after 5 mo of first opening the bottle

**IV Infusion**

- Visually inspect parenteral products for particulate matter and discoloration before use, do not use if discoloration or particulate matter is present, injection is a clear, colorless solution
- May be given IV without further dilution or may be mixed with a diluent, including 0.9% NaCl Injection, LR injection, or D5 injection
- Infuse over 2 to 15 min
- **Storage:** After dilution, the solution may be stored ≤ 4 hr at room temperature and may be stored in polyvinyl chloride (PVC) bags. Discard any unused injection vial contents, for single dose only

## ADVERSE EFFECTS

**CNS:** *Dizziness, drowsiness,* ataxia, euphoria, fatigue, irritability, depression, emotional lability, hallucinations, psychosis, suicidal ideation

**GI:** Constipation, nausea, vomiting

**HEMA:** Leukopenia

**INTEG:** Angioedema

**RESP:** Bronchospasm

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | unknown |
| **Distribution** | Protein binding 20% |
| **Metabolism** | By hydrolysis to form a hydroxy metabolite metabolized by CYP2C19 |
| **Excretion** | Urine feces <1% |
| **Half-life** | 9 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1 hr without food high-fat meal slows absorption |

## INTERACTIONS

### Drug classifications

Tricyclic antidepressants, antihistamines, benzodiazepines, other CNS depressants: Increased sedation

## INTERACTIONS

### Individual drugs

Carbamazepine: Increased toxicity possible
Sevelamer: Decreased brivaracetam absorption

### Drug/lab test

Increase: LFTs
Decrease: Hct/Hgb, WBC, RBC

## NURSING CONSIDERATIONS

### Assessment

- Seizures: Assess for type, location, duration, character; provide seizure precautions
- Renal studies: Monitor urinalysis, BUN, urine creatinine q3mo
- Blood studies: Monitor CBC, LFTs
- Mental status: Assess mood, sensorium, affect, behavioral changes, suicidal thoughts/behaviors; if mental status changes, notify prescriber
- Provide assistance with ambulation during early part of treatment, dizziness, drowsiness occurs

### Patient/family education

- Teach patient to carry emergency ID stating patient's name, medications taken, condition, prescriber's name, and phone number
- Teach patient how to use oral solution, use calibrated device to measure
- Advise the patient to notify prescriber if pregnancy is planned or suspected
- Advise the patient to avoid driving, other activities requiring alertness until response is known, drowsiness occurs during beginning therapy
- Teach patient not to discontinue quickly after long-term use, withdrawal seizure may occur
- Teach patient not to breastfeed
- Teach patient to report suicidal thoughts/behaviors immediately

### Evaluation

**Positive therapeutic outcome**

- Decreased seizure activity

## brodalumab (Rx)

(broe-dal'-ue-mab)

**Siliq**

*Func. class.:* Immunosuppressive

*Chem. class.:* Recombinant human IgG1 monoclonal antibody

**ACTION:** Human IgG2 monoclonal antibody that binds to interleukin-17 receptor A (IL-17RA) and prevents IL-17 cytokines from activating the receptor

**USES:** For the treatment of moderate to severe plaque psoriasis in those who are candidates for phototherapy or systemic therapy and have failed to respond or have lost response to other systemic therapies

## CONTRAINDICATIONS

Hypersensitivity, Crohn's disease

**Precautions:** Pregnancy, breastfeeding, children, depression, geriatric patients, immunosuppression, infection, suicidal ideation, vaccination

## DOSAGE AND ROUTES

**Adult: SUBCUT** 210 mg at weeks 0, 1, and 2 then 210 mg q2wk. Discontinue if inadequate response after 12 to 16 wk

**Available form:** Prefilled syringe 210 mg/1.5 ml

### Implementation

**SUBCUT route**

- Due to the product's association with suicidal ideation/behavior, this product is only available through a restricted program (SILIQ Risk Evaluation and Mitigation Strategy (REMS) Program). Those prescribing this product must be certified in the SILIQ REMS Program. Patients must sign a Patient-Prescriber Agreement Form. For information, visit the SILIQ REMS website or telephone 855-511-6135
- Remove prefilled syringe from refrigerator and allow to reach room temperature (about 30 min) without removing the needle cap, once brought to room temperature, do not place back into the refrigerator. If needed, the prefilled syringe may be stored at room temperature for up to 14 days. Any prefilled syringe that has been stored at room temperature for more than 14 days MUST be discarded.
- Do not shake the prefilled syringe. DO NOT use the prefilled syringe if it has been dropped on a hard surface. Use a new syringe and call 800-321-4576.
- Visually inspect for particulate matter and discoloration, the solution should be clear to slightly opalescent, colorless to slightly yellow, and may contain a few small translucent particles. Do not use if discolored, cloudy, or foreign particulate matter is present
- Only an individual trained in subcutaneous drug delivery should administer the injection. A patient who is properly trained in injection technique may self-inject using the prefilled syringe or vial, if his or her prescriber deems the action appropriate. However, the first injection needs to be under the supervision of a qualified health care professional
- Use front part of the middle thigh, the gluteal or abdominal region, and the outer area of the upper arm. For injection sites, rotate injection sites. Do not use where skin is tender, bruised, red, hard, thick, scaly, or affected by psoriasis
- Gently pinch the cleaned area of skin and insert the needle at about a 45-degree angle subcutaneously using a quick, dartlike motion. Push the plunger slowly and evenly to deliver the dose, remove the needle, and release the pinched skin. Do not rub the injection site; slight bleeding may occur
- Each single-use prefilled syringe contains 210 mg/1.5 ml of product. Inject the entire 1.5 ml contents of the syringe. No preservatives are present; discard any unused portion
- Protect from light, do not freeze

## ADVERSE EFFECTS

**CNS:** Headache, fatigue, suicidal ideation

**EENT:** Sinusitis

**GI:** Nausea, diarrhea

**MS:** Arthralgia

**INTEG:** Erythema, pruritus

**HEMA:** Bleeding, neutropenia

**MISC:** Infection, injection site reactions, antibody formation, pharyngitis, TB

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 55% |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | Unknown |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 3 days |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

CYP 450 enzymes (carbamazepine, cyclosporine, ethosuximide, fosphenytoin, phenytoin, tacrolimus, theophylline, aminophylline, warfarin). Increased altered effect of each product, monitor if products are initiated or discontinued, dose adjustments may be needed

Do not give concurrently with live virus vaccines; immunizations should be brought up to date before treatment

## NURSING CONSIDERATIONS

### Assessment

- Assess for injection site pain, swelling, redness—use cold compress to relieve pain/swelling give at 45-degree angle using abdomen, thighs; rotate injection sites; discard unused portions
- Infection: Assess for infections (fever, flu-like symptoms, dyspnea, change in urination, redness/swelling around any wounds), stop treatment if present; some serious infections including sepsis may occur, may be fatal; patients with active infections should not be started on this product
- **TB:** Obtain a TB test before starting this product, do not use in active TB, for latent TB, give antituberculosis therapy before use of this product, monitor closely for signs and symptoms of active tuberculosis infection during and after treatment
- Pregnancy/breastfeeding; No data, no data in breastfeeding, excretion unknown
- Suicidal ideation: There is an increased incidence of suicidal ideation and behavior among recipients with a history of suicidality or depression, assess the risks and benefits of treatment when considering use in those with a history of depression or psychosis

### Patient/family education

- Teach patient about self-administration if appropriate: Injection should be made in thigh, abdomen, upper arm; rotate sites at least 1 inch from old site; do not inject in areas that are bruised, red, hard
- Teach patient that if medication is not taken when due, inject next dose as soon as remembered and inject next dose as scheduled
- Teach patient not to take any live virus vaccines during treatment
- Teach patient to report signs of infection (fever, sweats, or chills; muscle aches; weight loss; cough; warm, red, or painful skin or sores on body different from psoriasis; diarrhea or stomach pain; shortness of breath; blood in phlegm (mucus); burning when urinate or urinating more often than normal); allergic reactions (itching, rash)
- Advise patient to tell provider of all prescription, OTC, herbals, and supplements currently taken
- **Suicidal ideation:** Advise patients and caregivers to seek medical attention for suicidal ideation, new-onset or worsening depression, anxiety, or other mood changes

### Evaluation

**Positive therapeutic outcome**

- Decreased in lesions

**RARELY USED**

## C1 esterase inhibitor subcutaneous, human

**Haegarda**

**USES:** For the routine prophylaxis to prevent hereditary angioedema attacks

## DOSAGE AND ROUTES

### For the treatment of acute attacks of hereditary angioedema (HAE)

**Adult and adolescent: ≥ 84 kg IV** Inject 4200 International Units (2 vials) as a slow intravenous injection over approximately 5 min; may give a second dose

**Adult and adolescent: < 84 kg IV** Inject 50 International Units per kg body weight up to 4200 International Units as a slow intravenous injection over approximately 5 min; may give second dose

**For routine angioedema prophylaxis in patients with hereditary angioedema**
**Adult/adolescent: SUBCUT** 60 International Units/kg twice weekly (every 3 or 4 days)

## CONTRAINDICATIONS
Leporine protein hypersensitivity

**RARELY USED**

### cerliponase alfa
**Brineura**
*Func. class.:* Alimentary tract and metabolism agents; lysosomal storage disorder agents

**USES:** For the treatment of late infantile neuronal ceroid lipofuscinosis type 2

## DOSAGE/ROUTES
**For the treatment of patients with late-infantile neuronal ceroid lipofuscinosis type 2 (CLN2) disease, a form of Batten disease**
**Child and adolescent 3 to 17 yr: IV** 300 mg every other wk. Give first at an infusion rate of 2.5 ml/hr, then with the required infusion of intraventricular electrolytes at the same infusion rate of 2.5 ml/hr (complete infusion time is 4.5 hr). Pretreatment with antihistamines with or without antipyretics or corticosteroids is recommended 30 to 60 min before the start of the infusion

**⚠ HIGH ALERT**

**RARELY USED**

### cobimetinib
(koe-bi-me'ti-nib)
**Cotellic**
*Func. class.:* Antineoplastic

**USES:** Orphan drug. For the treatment of unresectable or metastatic melanoma in patients with a BRAF V600E or V600K mutation, in combination with vemurafenib

## CONTRAINDICATIONS
Hypersensitivity

## DOSAGE AND ROUTES
**Adult: PO** 60 mg (three 20-mg tablets) qday × 21 days, in combination with vemurafenib 960 mg bid × 28 days; repeat cycle q28days until disease progression or unacceptable toxicity

**⚠ HIGH ALERT**

### copanlisib
(koh-pan'-lih-sib)
**Aliqopa**
*Func. class.:* Antineoplastic biologic response modifiers
*Chem. class.:* Tyrosine kinase inhibitor

**ACTION:** Inhibits tyrosine kinase created in patients with non-Hodgkin's lymphoma, induces tumor cell death by apoptosis and by inhibiting the proliferation of primary malignant B-cell lines

**USES:** For the treatment of non-Hodgkin's lymphoma (NHL)

## CONTRAINDICATIONS
Pregnancy, hypersensitivity

**Precautions:** Breastfeeding, contraception requirements, children, diabetes mellitus, diarrhea, geriatric patients, hepatic/pulmonary disease, hyperglycemia, hypertension, infertility, male-mediated teratogenicity, neutropenia, pneumonitis, bone marrow suppression, infection, reproductive risk, serious rash, thrombocytopenia

## DOSAGE AND ROUTES
**For the treatment of relapsed follicular lymphoma in patients who have received at least 2 prior systemic therapies**
**Adult: IV** 60 mg over 1 hr on days 1, 8, and 15 repeated q28days until disease progression

### Dosage adjustment for related toxicities
**Infection:**
***Grade 3 or higher toxicity:*** Hold until the infection resolves; ***suspected* Pneumocystis jiroveci *pneumonia (PJP) infection (any grade):*** Hold, if PJP diagnosis is confirmed, treat the infection until resolution and then resume product at the previous dose. PJP prophylaxis is recommended for the duration of therapy
**Hyperglycemia:**
***Predose fasting blood glucose of 160 mg/dl or higher or a random/nonfasting blood glucose of 200 mg/dl or higher:*** Hold until the fasting glucose is 160 mg/dl or less or a random/nonfasting blood glucose is 200 mg/dl or less; ***pre- or postdose blood glucose of 500 mg/dl or higher (first occurrence):*** Hold until fasting glucose is 160 mg/dl or less or a random/nonfasting blood glucose is 200 mg/dl or less; resume product at 45 mg; ***pre- or postdose blood glucose of 500 mg/dl or higher (subsequent occurrences):*** Hold product until fasting glucose is

160 mg/dl or less or a random/nonfasting blood glucose is 200 mg/dl or less; resume at 30 mg. Discontinue if hyperglycemia persists at the 30-mg dose

**Hypertension:**

***Predose systolic B/P of 150 mm Hg or higher or predose diastolic B/P of 90 mm Hg or higher:*** Hold until B/P is less than 150/90 mm Hg based on two consecutive measurements (taken at least 15 min apart); ***post-dose B/P of 150/90 mm Hg or higher (nonlife threatening):*** Continue product at the previous dose if antihypertensive treatment is not required. Consider a dose reduction (from 60 mg to 45 mg or from 45 mg to 30 mg) if antihypertensive treatment is required. Discontinue if hypertension persists despite antihypertensive treatment; ***post-dose B/P (life threatening):*** Discontinue

**Noninfectious pneumonitis;**

***grade 2 toxicity:*** Hold and treat with systemic corticosteroids. Resume at 45 mg when the toxicity recovers to grade 1 or less. Discontinue if grade 2 toxicity recurs; ***grade 3 or higher toxicity:*** Discontinue

**Neutropenia:**

***Absolute neutrophil count (ANC) of 0.5 to 1 $\times$ $10^3$*** cells/$mm^3$: Continue at the previous dose and monitor the ANC at least weekly; ***ANC of less than 0.5 $\times$ $10^3$*** cells/$mm^3$: Hold, monitor the ANC at least weekly until the ANC is $0.5 \times 10^3$ cells/$mm^3$ or greater; resume at the previous dose. Reduce to 45 mg if an ANC of $0.5 \times 10^3$ cells/$mm^3$ or less recurs

**Thrombocytopenia:**

***Platelet count less than 25 $\times$ $10^9$*** cells/L: Hold, resume at a reduced dose (from 60 mg to 45 mg or from 45 mg to 30 mg) if the platelet count recovers to $75 \times 10^9$ cells/L or greater within 21 days. Discontinue if the platelet count does not recover to $75 \times 10^9$ cells/L within 21 days

**Severe cutaneous reactions:**

***Grade 3 toxicity:*** Hold until the toxicity resolves. Resume at a reduced dose (from 60 mg to 45 mg or from 45 mg to 30 mg); ***life-threatening (grade 4) toxicity:*** Discontinue

**Other severe and non-life-threatening toxicities:**

***Grade 3 toxicity:*** Hold until the toxicity resolves, resume at a reduced dose (from 60 mg to 45 mg or from 45 mg to 30 mg); ***grade 4 or life-threatening toxicity***: Discontinue

**Available forms:** Powder for injection 60 mg

## IMPLEMENTATION

**IV route**

- Visually inspect for particulate matter and discoloration before use

**Reconstitution:**

- Add 4.4 ml of sterile 0.9% NaCl injection to the 60-mg lyophilized powder vial (15/ml)
- Gently shake and then allow to stand for 1 min letting the bubbles rise to the surface; repeat if needed, solution will be colorless to slightly yellowish
- Storage of reconstituted vial: If not diluted immediately, store refrigerated at 2 to 8° C (36 to 46° F) for up to 24 hr before use; protect from direct sunlight

**Dilution**

- Into an infusion bag containing 100 ml of sterile 0.9% sodium chloride injection, add the appropriate volume (based on the desired dose) from the reconstituted vial as follows: **60-mg dose:** 4 ml; **45-mg dose:** 3 ml; **30-mg dose:** 2 ml
- Invert the infusion bag to mix
- Discard any unused contents from the reconstituted vial
- *Storage of diluted admixture:* If not used immediately, store refrigerated at 2 to 8° degrees C (36 to 46° F) for up to 24 hr (from vial reconstitution) before use; protect from direct sunlight

### Intermittent IV Infusion

- Allow the diluted admixture in the infusion bag to warm to room temperature (if stored in refrigerator) before use
- Give over 1 hr
- Do not mix or inject product with other drugs or diluents
- Follow cytotoxic handling procedures

## ADVERSE EFFECTS

**CNS:** Fatigue

**GI:** Nausea, vomiting, diarrhea, stomatitis

**HEMA:** *Anemia,* neutropenia, thrombocytopenia, bleeding, lymphopenia

**INTEG:** Rash, exfoliative dermatitis

**ENDO:** Hyperglycemia, hypophosphatemia

**MISC:** Hypertriglyceridemia, hyperuricemia

### Pharmacokinetics

| | |
|---|---|
| **Distribution** | Protein binding 84.2% |
| **Metabolism** | Avoid use with strong CYP3A inhibitors or inducers, this product is a substrate of the P-glycoprotein (P-gp) and breast cancer resistance protein (BCRP) transporters and a multidrug and toxin extrusion member 2 (MATE2)-K inhibitor |

## INTERACTIONS

CYP3A4 inhibitors (ketoconazole, itraconazole, erythromycin, clarithromycin), P-gp inhibitors: Increased copanlisib concentrations

Increased plasma concentrations of simvastatin, calcium channel blockers, ergots

CYP3A4 inducers (dexamethasone, phenytoin, carBAMazepine, rifampin, PHENobarbital), antacids, proton pump inhibitors: Decreased copanlisib concentrations

### Drug/food

Increased copanlisib effect—grapefruit juice; avoid use while taking product

### Drug/herb

Decreased copanlisib concentration—St. John's wort

### Drug/lab test

Increased uric acid, blood glucose, triglycerides

Decreased phosphate

## NURSING CONSIDERATIONS

### Assessment

- **Serious infection:** Some may be fatal. Monitor patient for signs and symptoms of infection; hold therapy for grade 3 or higher infection. Serious *Pneumocystis jiroveci* pneumonia (PJP) has occurred; consider PJP prophylaxis in at-risk patients before starting treatment, hold if PJP is suspected. If PJP diagnosis is confirmed, treat the infection until resolution and then resume at the previous dose and give PJP prophylaxis for the duration of therapy
- **Myelosuppression:** Anemia, thrombocytopenia, neutropenia; obtain a CBC at least weekly during treatment
- **Pregnancy/breastfeeding:** Product can cause fetal harm, females of reproductive potential should avoid becoming pregnant while taking this product; malformations may occur; do not breastfeed during and for at least 1 mo after the last dose; men with female partners of reproductive potential should avoid fathering a child and use effective contraception during and for at least 1 mo after therapy
- **Severe hyperglycemia**: Elevated HbA1c and infusion-related hyperglycemia have occurred; monitor blood glucose levels before and after the infusion, product interruption, dose reduction, or discontinuation may be needed for hyperglycemia. Blood glucose levels typically peak at 5 to 8 hr postinfusion and then decline to baseline levels in most patients. Use with caution in diabetes mellitus. Initiate product after these patients have achieved optimal blood glucose control; monitor blood glucose levels in these patients closely
- **Severe hypertension and infusion-related hypertension:** Use with caution in those with preexisting hypertension; monitor B/P before and after the infusion; optimal B/P control should be achieved before each dose. Therapy interruption, dose reduction, or therapy discontinuation may be necessary in patients who develop hypertension. A mean increase in systolic (+16.8 mm Hg) and diastolic (+7.8 mm Hg) B/P was observed at 2 hr postinfusion on day 1 of cycle 1; B/P may remain elevated for 6-8 hr after the start of the infusion

### Evaluation

**Positive therapeutic outcome**

- Improving blood counts

### Patient/family education

- Teach patient to report adverse reactions immediately, bleeding; report diarrhea, hepatic, hematologic symptoms/toxicity, flulike symptoms
- Teach patient about reason for treatment, expected results
- **Pregnancy/breastfeeding:** Teach patient to notify provider if pregnancy is planned or suspected, to use effective contraception during treatment and up to 30 days after discontinuing treatment, not to use during pregnancy, breastfeeding; men with female partners of reproductive potential should be cautioned to avoid fathering a child and use effective contraception during and for at least 1 mo after therapy

**⚠ HIGH ALERT**

**RARELY USED**

# daratumumab

(dar' a- toom-ue-mab)

**Darzalex**

*Func. class.:* Antineoplastic

**USES:** For the treatment of multiple myeloma in patients who have received at least 3 prior lines of therapy including a proteasome inhibitor (PI) and an immunomodulatory agent or who are double-refractory to a PI and an immunomodulatory agent

## CONTRAINDICATIONS

Hypersensitivity

## DOSAGE AND ROUTES

**Adult: IV** 16 mg/kg (actual body weight) weekly on weeks 1 to 8 (8 doses), 16 mg/kg q other week on weeks 9 to 24 (8 doses), and then 16 mg/kg q4wk starting on week 25 until disease progression.

⚠ HIGH ALERT

RARELY USED

## daunorubicin/cytarabine

(daw-noe-roo'bi-sin sye-tare'a-been)

**Vyxeos**

*Func. class.:* Antineoplastic

**USES:** For the treatment of newly diagnosed therapy-related AML or AML with myelodysplasia-related changes

### DOSAGES AND ROUTES

**Adult: IV** First induction, 44 mg/m$^2$ daunorubicin liposomal and 100 mg/m$^2$ cytarabine liposomal over 90 min on days 1, 3, and 5; patients who do not achieve a response may receive a second induction. Second induction (given 2 to 5 wk after the first induction cycle), 44 mg/m$^2$ daunorubicin liposomal and 100 mg/m$^2$ cytarabine liposomal on days 1 and 3. Consolidation therapy (given 5 to 8 wk after the start of the last induction), 29 mg/m$^2$ daunorubicin liposomal and 65 mg/m$^2$ cytarabine liposomal on days 1 and 3. Patients without disease progression or unacceptable toxicity should receive a second cycle of consolidation therapy given 5 to 8 wk after the start of the previous consolidation

RARELY USED

## delafloxacin

(dela-flox'-a-sin)

**Baxdela**

*Func. class.:* Antiinfective

**USES:** For the treatment of acute bacterial skin and skin structure infections

### DOSAGE AND ROUTES

**Adult: PO** 450 mg q12hr × 5 to 14 days; **IV** 300 mg q12hr × 5 to 14 days

**Available forms:** Tablets and injection

RARELY USED

## deutetrabenazine

**Austedo**

**USES:** For the treatment of chorea associated with Huntington's disease or tardive dyskinesia

### DOSAGE AND ROUTES

**For the treatment of chorea associated with Huntington's disease (Huntington's chorea) or tardive dyskinesia**

**Adult: PO** in treatment-naive patients (patients not switching from tetrabenazine) initially, 6 mg qday, increase at weekly intervals by increments of 6 mg/day to a max of 48 mg/day; in patients switching from tetrabenazine: Discontinue tetrabenazine and start deutetrabenazine the next day. Current tetrabenazine dosage of 12.5 mg/day, initiate deutetrabenazine 6 mg once daily; tetrabenazine 25 mg/day, initiate deutetrabenazine 6 mg twice daily; tetrabenazine 37.5 mg/day, initiate deutetrabenazine 9 mg twice daily; tetrabenazine 50 mg/day, initiate deutetrabenazine 12 mg twice daily; tetrabenazine 62.5 mg/day, initiate deutetrabenazine 15 mg twice daily; tetrabenazine 75 mg/day, initiate deutetrabenazine 18 mg twice daily; tetrabenazine 87.5 mg/day, initiate deutetrabenazine 21 mg twice daily; tetrabenazine 100 mg/day, initiate deutetrabenazine 24 mg twice daily

### CONTRAINDICATIONS

Hypersensitivity, hepatic disease, MAOIs

**BLACK BOX WARNING:** Suicidal ideation

RARELY USED

## dolutegravir/rilpivirine

(doe-loo-teg'- ra- vir/ril-pi-vir'-een)

**Juluca**

*Func. class.:* Antiviral

**USES:** For the treatment of HIV-1 infection in adults

### DOSAGES AND ROUTES

**For the treatment of HIV infection in adults who are virologically suppressed (HIV-1 RNA <50 copies per ml) on a stable antiretroviral regimen for at least 6 mo with no history of treatment failure and no known substitutions associated with resistance to the individual components with concurrent rifabutin**

**Adult: PO** 1 tab (dolutegravir 50 mg; rilpivirine 25 mg) plus an additional 25 mg tablet of rilpivirine (total daily rilpivirine dose of 50 mg) qday with a meal. When rifabutin coadministration is stopped, reduce rilpivirine dose to 25 mg qday with a meal

**For the treatment of human immunodeficiency virus (HIV) infection without concurrent rifabutin**
**Adult: PO** 1 tab (dolutegravir 50 mg; rilpivirine 25 mg) qday with a meal

## RARELY USED

### dupilumab
(doo-pil′-ue-mab)
**Dupixent**
*Func. class.:* Dermatologicals

**USES:** For the treatment of moderate-to-severe atopic dermatitis in patients whose disease is not adequately controlled with topical therapies or when those therapies are not advised

## DOSAGE AND ROUTES
**Adult: SUBCUT** 600 mg initially (administered as two 300-mg injections), then 300 mg every other week

## ⚠ HIGH ALERT

### durvalumab
(dur-val′-yoo-mab)
**Imfinzi**
*Func. class.:* Antineoplastic monoclonal antibodies

**ACTION:** A human IgG1 kappa (IgG1k) monoclonal antibody, produced in Chinese hamster ovary, inhibits programmed death ligand interactions

**USES:** For the treatment of advanced or metastatic urothelial carcinoma

## CONTRAINDICATIONS
Pregnancy, hypersensitivity

**Precautions:** Adrenal insufficiency, aseptic meningitis, autoimmune disease, breastfeeding, colitis, contraception requirements, Crohn's disease, diabetes mellitus, diarrhea, hemolytic anemia, hepatic disease, hepatitis, hypophysitis, hypopituitarism, IBS, infusion-related reactions, keratitis, myocarditis, organ transplant, pneumonitis, pulmonary disease, reproductive risk, serious rash, SLE, thyroid disease, ulcerative colitis, uveitis

## DOSAGE AND ROUTES
**For the treatment of locally advanced or metastatic urothelial carcinoma, in patients with disease progression on or after platinum-containing chemotherapy, or within 12 mo of neoadjuvant or adjuvant platinum-containing chemotherapy**
**Adult: IV** 10 mg/kg over 60 min, q2wk until disease progression or unacceptable toxicity

**Management of immune-mediated toxicities (dose reductions are not recommended; manage adverse reactions by interruption or discontinuation of therapy as appropriate)**
**Adrenal insufficiency:**
***Grade 2 to 4:*** Hold until patient is stable and start corticosteroids (1-2 mg/kg/day of predniSONE or equivalent). Begin hormone replacement therapy as needed. When adrenal insufficiency improves to grade 1 or less, begin a steroid taper over at least 1 mo
**Colitis or diarrhea:**
***Grade 2:*** Hold and start corticosteroids (1-2 mg/kg/day of predniSONE or equivalent). If there is worsening or no improvement, increase corticosteroids and/or other systemic immunosuppressants. When colitis improves to grade 1 or less, begin a steroid taper over at least 1 mo. Treatment may be resumed without a dose reduction when colitis is less than or equal to grade 1 and the corticosteroid dose has been reduced to less than 10 mg of predniSONE or equivalent per day. ***Grade 3 or 4:*** Permanently discontinue and start corticosteroids (1-2 mg/kg/day of predniSONE or equivalent). If there is worsening or no improvement, consider increasing the dose of corticosteroids and/or other systemic immunosuppressants. When colitis improves to grade 1 or less, begin a steroid taper over at least 1 mo
**Diabetes, Type 1:**
***Grade 2 to 4:*** Hold until patient is stable and start insulin as needed
**Hypophysitis:**
***Grade 2 to 4:*** Hold until patient is stable and start corticosteroids (1- 2 mg/kg/day of predniSONE or equivalent). Begin hormone replacement therapy as needed. When hypophysitis improves to grade 1 or less, begin a steroid taper over at least 1 mo

**Infection:**
***Grade 3 or 4:*** Hold and initiate symptomatic management; treat with antiinfectives for suspected or confirmed infections

**Infusion-related reactions:**
***Grade 1 or 2:*** Interrupt or slow the rate of the infusion. Consider premedications before subsequent dosing. *Grade 3 or 4:* Permanently discontinue

**Pneumonitis/interstitial lung disease (ILD):**
***Grade 2:*** Hold and start corticosteroids (1-2 mg/kg/day of predniSONE or equivalent). If there is worsening or no improvement, increase the dose of corticosteroids, other systemic immunosuppressants. When pneumonitis improves to grade 1 or less, begin a steroid taper over at least 1 mo. Treatment may be resumed without a dose reduction when pneumonitis is less than or equal to grade 1 and the corticosteroid dose has been reduced to less than 10 mg of predniSONE or equivalent per day. ***Grade 3 or 4:*** Permanently discontinue and start corticosteroids (1 to 4 mg/kg/day of predniSONE or equivalent). If there is worsening or no improvement, consider increasing the dose of corticosteroids and/or other systemic immunosuppressants. When pneumonitis improves to grade 1 or less, begin a steroid taper over at least 1 mo

**Rash:**
***Grade 2 for more than 1 week or grade 3:*** Hold and start corticosteroids (1-2 mg/kg/day of predniSONE or equivalent). If there is worsening or no improvement, consider increasing the dose of corticosteroids and/or other systemic immunosuppressants. When the rash improves to grade 1 or less, begin a steroid taper over at least 1 mo. Treatment may be resumed without a dose reduction when the rash is less than or equal to grade 1 and the corticosteroid dose has been reduced to less than 10 mg of predniSONE or equivalent per day. ***Grade 4:*** Permanently discontinue and start corticosteroids (1 to 2 mg/kg/day of predniSONE or equivalent). If there is worsening or no improvement, consider increasing the dose of corticosteroids and/or other systemic immunosuppressants. When the rash improves to grade 1 or less, begin a steroid taper over at least 1 mo

**Thyroid disorders:**
***Hypothyroidism, grade 2 to 4:*** Initiate thyroid hormone replacement as needed. ***Hyperthyroidism, grade 2 to 4:*** Hold until patient is clinically stable. Manage patient symptomatically as clinically indicated

**Other immune-mediated toxicities:**
***Grade 3:*** Hold and begin symptomatic management of the toxicity. Based on the severity of the reaction, may use of corticosteroids. If there is worsening or no improvement, consider increasing the dose of corticosteroids and/or other systemic immunosuppressants. When the toxicity improves to grade 1 or less, begin a steroid taper over at least 1 mo. Treatment may be resumed without a dose reduction when the toxicity is less than or equal to grade 1 and the corticosteroid dose has been reduced to less than 10 mg of predniSONE or equivalent per day. ***Grade 4:*** Permanently discontinue and start symptomatic treatment and corticosteroids (1 to 4 mg/kg/day of predniSONE or equivalent). If there is worsening or no improvement, consider increasing the dose of corticosteroids and/or other systemic immunosuppressants. When the toxicity improves to grade 1 or less, begin a steroid taper over at least 1 mo

## Patients with hepatic impairment dosing

**Baseline hepatic impairment:**
***Mild hepatic impairment:*** No change. ***Moderate (bilirubin 1.5 to 3 times the upper limit of normal [ULN] and any AST) or severe (bilirubin greater than 3 times ULN and any AST):*** Specific guidelines unknown

**Management of immune-mediated hepatitis:**
***ALT/AST 3.1 to 5 times the upper limit of normal (ULN) or total bilirubin 1.6 to 3 times ULN (grade 2):*** Hold and start treatment with corticosteroids (1 to 2 mg/kg/day of predniSONE or equivalent). If there is worsening or no improvement, consider increasing the dose of corticosteroids, other systemic immunosuppressants. When hepatitis improves to grade 1 or less, begin a steroid taper over at least 1 mo. ***ALT/AST less than or equal to 8 times ULN or total bilirubin less than or equal to 5 times ULN (grade 3a):*** Hold and start corticosteroids (1 to 2 mg/kg/day predniSONE or equivalent). If there is worsening or no improvement, increase corticosteroids, systemic immunosuppressants. When hepatitis improves to grade 1 or less, begin a steroid taper over at least 1 mo. ***ALT/AST greater than 8 times ULN or total bilirubin greater than 5 times ULN (grade 3b):*** Permanently discontinue and start corticosteroids (1 to 2 mg/kg/day of predniSONE or equivalent). If there is worsening or no improvement, increase the dose of corticosteroids, systemic immunosuppressants. When hepatitis improves to grade 1 or less, begin a steroid taper over at least 1 mo. ***Concurrent ALT/AST greater than 3 times ULN and total bilirubin greater than 2 times ULN with no***

***other cause:*** Permanently discontinue and start corticosteroids (1 to 2 mg/kg/day of predniSONE or equivalent). If there is worsening or no improvement, consider increase the dose of corticosteroids, systemic immunosuppressants. When hepatitis improves to grade 1 or less, begin a steroid taper over at least 1 mo

### Renal dose

Mild to moderate renal impairment (Ccr greater than or equal to 30 ml/min): No change; severe renal impairment (Ccr 15 to 29 ml/min): Unknown

**Available forms:** Powder for injection 120 mg/2.4 ml, 500 mg/10 ml

### Implementation

**IV route**

- Follow cytotoxic handling procedures
- Visually inspect for particulate matter and discoloration, product should be clear to opalescent, colorless to slightly yellow, free from particles. Discard if the solution is cloudy, discolored, or particles are observed
- Do not shake

### Preparation

- **Withdraw** the required volume of drug and transfer into an intravenous container containing 0.9% sodium chloride injection or 5% dextrose injection, to prepare an infusion with a final concentration ranging from 1 mg/ml to 15 mg/ml
- **Mix** diluted solution by gentle inversion. Do not shake
- **Discard** partially used or empty vials of durvalumab

### Storage of diluted solution

- Does not contain a preservative; give immediately after preparation
- If storage of the diluted solution is necessary, the total time from vial puncture to the start of administration should be less than 24 hr if refrigerated (2 to 8° C; 36 to 46° F), or less than 4 hr at room temperature (up to 25° C; up to 77° F). Do not freeze

**IV infusion**

- **Give** diluted over 60 min through an IV line using a low-protein-binding 0.2 or 0.22 micron in-line filter
- Do not admix or give other products through the same line

## ADVERSE EFFECTS

**CNS:** *Fatigue, fever*

**GI:** *Nausea, diarrhea, constipation, anorexia, abdominal pain,* colitis

**HEMA:** Anemia, hemolytic anemia, lymphopenia

**RESP:** Cough, dyspnea

**META:** Hyponatremia, hyperbilirubinemia, hypercalcemia, hypermagnesemia, hypoalbuminemia

**ENDO:** Hyperglycemia, hyper- or hypothyroidism

**MISC:** Infection, peripheral edema, infection, musculoskeletal pain, rash, antibody formation, aseptic meningitis, dehydration, infusion reactions, keratitis, myocarditis, uveitis

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Steady state 16 wk |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 17 days |

## INTERACTIONS

None known

### Drug/lab test

Increased: LFTs, blood glucose, serum creatinine/BUN, thyroid function tests
Decreased: Thyroid function tests

## NURSING CONSIDERATIONS

### Assessment

- Monitor baseline and periodically blood glucose, LFTs, serum creatinine/BUN
- **Serious infection**: Some may be fatal. Monitor patients for signs and symptoms of infection; use prophylactic anti-infectives as appropriate
- **Pregnancy/breastfeeding:** Product can cause fetal harm, females of reproductive potential should avoid becoming pregnant during and for 3 mo after final dose; obtain a pregnancy test before starting product, do not breastfeed during and for at least 3 mo after the last dose
- **Immune-mediated pneumonitis or interstitial lung disease (ILD):** May be fatal. Monitor for signs or symptoms (new or worsening chest pain or shortness of breath) of pneumonitis. If pneumonitis is suspected, obtain a chest x-ray; an interruption or discontinuation of therapy and treatment with high-dose corticosteroids (followed by a steroid taper) may be necessary. The median time to onset of immune-mediated pneumonitis was 55.5 days (range 24 to 423 days)
- **Immune-mediated hepatitis**: May be fatal. Monitor for abnormal liver tests before each cycle of treatment interruption or discontinuation of therapy may be needed with high-dose corticosteroids (followed by a steroid taper). The median time to onset of immune-mediated hepatitis was 51.5 days (range 15 to 312 days)

• **Diarrhea and immune-mediated colitis**: Monitor for signs and symptoms of colitis (diarrhea or severe abdominal pain). Treatment with antidiarrheal agents and high-dose corticosteroids (followed by a steroid taper), along with an interruption or discontinuation of therapy, may be necessary. The median time to onset of immune-mediated colitis was 73 days (range 13 to 345 days). Use with caution in those with inflammatory bowel disease such as ulcerative colitis or Crohn's disease
• **Thyroid disease/disorders (hypothyroidism/hyperthyroidism:** Monitor thyroid function tests (TFTs) at baseline and periodically during treatment. Asymptomatic patients with abnormal TFTs can receive treatment, manage these patients with hormone replacement and symptomatic management as needed. The median time to onset of hypothyroidism was 42 days (range 15 to 239 days), and the median time to first onset of hyperthyroidism was 43 days (range 14 to 71 days)
• **Immune-mediated adrenal insufficiency and hypophysitis/hypopituitarism:** Monitor for signs and symptoms of adrenal insufficiency (hypotension, decreased cortisol level, fatigue, weakness, and weight loss) and hypophysitis (decreased pituitary hormone levels, pituitary gland inflammation, severe intractable headache, and vision impairment) during and after treatment. An interruption of therapy, treatment with high-dose corticosteroids, and hormone replacement may be necessary
• **Immune-mediated nephritis:** Monitor renal function at baseline and before each cycle of treatment. No initial dose adjustment is recommended in patients with renal dysfunction; use with caution in patients with renal disease or renal impairment. If immune-mediated nephritis occurs, an interruption or discontinuation of therapy may be needed with treatment with high-dose corticosteroids
• **Immune-mediated reactions (aseptic meningitis, hemolytic anemia, immune thrombocytopenic purpura, myocarditis, myositis) and ocular inflammatory toxicity (uveitis and keratitis):** Monitor for signs and symptoms of immune-mediated reactions; confirm etiology or exclude other causes. Therapy may need to be temporarily withheld or permanently discontinued; administer corticosteroids as needed
• **Severe infusion-related reactions**: Monitor signs and symptoms of an infusion-related reaction. Interrupt or slow the rate of infusion in those with mild or moderate infusion reactions. Permanently discontinue in those with grade 3 or 4 infusion reactions

### Patient/family education

• Teach patient to report adverse reactions immediately, report diarrhea, hepatic, flulike symptoms, cough, trouble breathing
• Teach patient about reason for treatment, expected results
• **Pregnancy/breastfeeding:** Teach patient to notify provider if pregnancy is planned or suspected, to use effective contraception during treatment and for 3 mo after discontinuing treatment, breastfeeding or for 3 mo after final dose

### Evaluation

**Positive therapeutic outcome**
• Lack of disease progression

**RARELY USED**

## edaravone

(e-dar'-a-vone)
**Radicava**
*Func. class.:* CNS agents

**USES:** For the treatment of amyotrophic lateral sclerosis

## DOSAGE AND ROUTES

**For the treatment of amyotrophic lateral sclerosis (ALS)**
**Adult: IV** 60 mg qday × 14 days then a 14-day drug-free period for an initial treatment cycle. For subsequent cycles, give × 10 days out of 14-day periods followed by 14-day drug-free periods

**⚠ HIGH ALERT**
**RARELY USED**

## enasidenib

(en'-a-sid'-a-nib)
**IDHIFA**
*Func. class.:* Antineoplastic

**USES:** For the treatment of relapsed or refractory acute myeloid leukemia with IDH2 mutation

## DOSAGE AND ROUTES

**For the treatment of relapsed or refractory AML with an isocitrate dehydrogenase-2 (IDH2) mutation**
**Adult: PO** 100 mg qday until disease progression. Treat those without disease progression for a minimum of 6 mo to allow time for clinical response

**RARELY USED**

## ertugliflozin

(er-too-gli-floe'-zin)
**Steglatro**
*Func. class.:* Antidiabetic

**USES:** For the treatment of type 2 diabetes mellitus

## DOSAGE AND ROUTES

**For the treatment of type 2 diabetes mellitus in combination with diet and exercise**
**Adult: PO** 5 mg qday, in the morning, with or without food, max: 15 mg qday

**RARELY USED**

## etelcalcetide

(e-tel-kal'-se-tide)
**Parsabiv**
*Func. class.:* Parathyroid analogs

**USES:** For the treatment of secondary hyperparathyroidism in adults with chronic kidney disease on hemodialysis

## DOSAGE AND ROUTES

**For the treatment of secondary hyperparathyroidism in patients with chronic kidney disease on hemodialysis**
**Adult: IV** 5 mg 3 times/wk at the end of hemodialysis treatment

**For patients switching from cinacalcet to etelcalcetide**
**Adult: IV** 5 mg 3 times/wk at the end of hemodialysis treatment after discontinuing etelcacetide for at least 7 days

## guselkumab (Rx)

(gus-elk'-ue-mab)
**Tremfya**
*Func. class.:* Antirheumatic agent (disease modifying), immunomodulator, anti-TNF
*Chem. class.:* Recombinant human IgG1 monoclonal antibody, DMARD

**ACTION:** A form of human IgG1 monoclonal antibody selectively binds to the p19 subunit of interleukin 23 (IL-23) cytokine, inhibiting its interaction with the IL-23 receptor. A naturally occurring cytokine, IL-23 is involved in normal inflammatory and immune responses. By inhibiting the interaction of IL-23 with its receptor, blocks the release of proinflammatory cytokines and chemokines

**USES:** For the treatment of moderate to severe plaque psoriasis in those who are candidates for phototherapy or systemic therapy

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, geriatric patients, infection, vaccination

## DOSAGE AND ROUTES

**Adult: SUBCUT** 100 mg at week 0, week 4, and every 8 wk thereafter

**Available forms:** Prefilled syringe 100 mg/ml

### Implementation

**SUBCUT route**

- Remove prefilled syringe from refrigerator and allow to reach room temperature (about 30 min) without removing the needle cap
- Do not shake the prefilled syringe
- Visually inspect for particulate matter and discoloration, the solution should be colorless to slightly yellow and may contain a few small translucent particles. Do not use if discolored, cloudy, or if foreign particulate matter is present
- Only an individual trained in subcutaneous drug delivery should administer the injection. A patient who is properly trained in injection technique may self-inject using the prefilled syringe or vial, if his or her prescriber deems the action appropriate. However, the first injection needs to be under the supervision of a qualified health care professional
- Use front part of the middle thigh, the gluteal or abdominal region, and the outer area of the upper arm. For injection sites, rotate injection sites. Do not use where skin is tender, bruised, red, hard, thick, scaly, or affected by psoriasis
- Gently pinch the cleaned area of skin and insert the needle at about a 45-degree angle subcutaneously using a quick, dartlike motion. Push the plunger slowly and evenly to deliver the dose, remove the needle, and release the pinched skin. Do not rub the injection site; slight bleeding may occur
- Each single-use prefilled syringe contains 100 mg/ml of product. Inject the entire 1 ml contents of the syringe. No preservatives are present; discard any unused portion
- Protect from light, do not freeze

## ADVERSE EFFECTS

**CNS:** Headache

**EENT:** Sinusitis

**GI:** Diarrhea

**MS:** Arthralgia

**INTEG:** Erythema, pruritus, skin discoloration

**HEMA:** Bleeding

**MISC:** Infection, injection site reactions, antibody formation, pharyngitis, edema, TB

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | 49% |
| **Distribution** | Unknown |
| **Metabolism** | Unknown |
| **Excretion** | Unknown |
| **Half-life** | 15-18 days |

### Pharmacodynamics

| | |
|---|---|
| **Onset, peak duration** | Unknown |

## INTERACTIONS

Avoid use with CYP2D6 substrates

Do not give concurrently with live virus vaccines; immunizations should be brought up to date before treatment

### Drug/lab test

Increased: ALT, AST

## NURSING CONSIDERATIONS

### Assessment

- Assess for injection site pain, swelling, redness—use cold compress to relieve pain/swelling, give at 45-degree angle using abdomen, thighs; rotate injection sites; discard unused portions
- **Infection**: Assess for infections (fever, flu-like symptoms, dyspnea, change in urination, redness/swelling around any wounds), stop treatment if present; some serious infections, including sepsis, may occur, may be fatal; patients with active infections should not be started on this product
- **TB:** Obtain a TB test before starting this product, do not use in active TB; for latent TB, give antituberculosis therapy before use of this product, monitor closely for signs and symptoms of active tuberculosis infection during and after treatment
- **Pregnancy/breastfeeding**: Use only if benefits outweigh fetal risk, cautious use in breastfeeding, excretion unknown

### Patient/family education

- Teach patient about self-administration if appropriate: Injection should be made in thigh, abdomen, upper arm; rotate sites at least 1 inch from old site; do not inject in areas that are bruised, red, hard
- Teach patient that if medication is not taken when due, inject next dose as soon as remembered and inject next dose as scheduled
- Teach patient not to take any live virus vaccines during treatment
- Teach patient to report signs of infection (fever, sweats, or chills; muscle aches; weight loss; cough; warm, red, or painful skin or sores on body different from psoriasis; diarrhea or stomach pain; shortness of breath; blood in phlegm (mucus); burning when urinate or urinating more often than normal); allergic reactions (itching, rash)
- Advise patient to tell provider of all prescription, OTC, herbals, and supplements currently taken

### Evaluation

**Positive therapeutic outcome**

- Decrease in lesions

# inotuzumab ozogamicin

(ih-noh-too′-zoo-mab oh′-zoh-ga-MIH-sin)

**Besponsa**

*Func. class.:* Antineoplastic monoclonal antibodies

**ACTION:** A CD22-directed antibody-drug conjugate, CD22 is expressed on pre-B-cells and mature B-cells. Consists of a cytotoxic agent; it induces double-strand DNA breaks, resulting in cell cycle arrest and apoptotic cell death

**USES:** For the treatment of adults with relapsed or refractory B-cell precursor acute lymphoblastic leukemia

## CONTRAINDICATIONS

Pregnancy, hypersensitivity

**Precautions:** Alcoholism, bleeding, breastfeeding, contraception requirements, diabetes mellitus, electrolyte imbalances, females, geriatric patients, infertility, male-mediated teratogenicity, neutropenia, bone marrow suppression, infection, reproductive risk, thrombocytopenia, thyroid disease, QT prolongation

**BLACK BOX WARNING:** Hepatic disease, hepatotoxicity, mortality, sinusoidal obstructive disease, venoocclusive disease

## DOSAGE AND ROUTES

### For the treatment of relapsed or refractory B-cell precursor ALL

**Adult: IV** 0.8 mg/m$^2$ day 1 and 0.5 mg/m$^2$ days 8 and 15 (cycle 1). Length of cycle 1 is 21 days, may extend to 28 days in those who achieve a

complete remission (CR) or a complete remission with incomplete hematologic recovery (CRi) or to allow for recovery from toxicity. In patients who do not achieve a CR or CRi, give product at the same dosage (0.8 mg/m$^2$ on day 1 and 0.5 mg/m$^2$ on days 8 and 15) repeated q8days; discontinue if a CR or CRi is not achieved after 3 cycles. In patients who achieve a CR or CRi, give product 0.5 mg/m$^2$ on days 1, 8, and 15 repeated q28days. In patients who proceed to hematopoietic stem cell transplant (HSCT), administer 2 cycles of therapy; consider a third cycle in patients who do not achieve CR or CRi and minimal residual disease (MRD) negativity after 2 cycles. Patients not proceeding to HSCT should receive a maximum of 6 cycles of therapy.

## Management of treatment-related toxicity

Do not interrupt doses within a treatment cycle (day 8 or day 15 dose) for neutropenia or thrombocytopenia. Dosing interruptions within a cycle are recommended for nonhematologic toxicity. If a dose reduction is necessary, do not re-escalate the dose

**Hematologic toxicity:**

***Absolute neutrophil count (ANC) of 1 × 10$^9$*** cells/L or greater before starting therapy: If the ANC decreases, hold the next cycle of therapy until recovery of the ANC to 1 × 10$^9$ cells/L or greater. Discontinue therapy if low ANC lasts longer than 28 days and is suspected to be due to inotuzumab ozogamicin. ***Platelet count of 50 × 10$^9$*** cells/L or greater before starting ***therapy:*** If platelet count decreases, hold the next cycle of therapy until the platelet count recovers to 50 × 10$^9$ cells/L or greater. Discontinue therapy if low platelet count lasts longer than 28 days and is suspected to be due to inotuzumab ozogamicin. ***ANC was less than 1 × 109 cells/L and/or platelet count was less than 50 X 10$^9$*** cells/L before starting therapy: If the ANC or platelet count decreases, hold the next cycle until at least 1 of the following occurs: the ANC and platelet counts recover to baseline or better for the prior cycle; the ANC recovers to 1 × 10$^9$ cells/L or greater and the platelet count recovers to 50 × 10$^9$ cells/L or greater; the patient has stable or improved disease (based on most recent bone marrow assessment) and the ANC and platelet count decrease is considered to be due to the underlying disease and not product-related toxicity

**Infusion-related reactions:**

***Mild to moderate reactions:*** Hold infusion and start medical management. Consider discontinuing or give steroids and antihistamines depending on the severity; ***severe or life-threatening reactions:*** Stop infusion, permanently discontinue

**Nonhematologic toxicity:**

Evaluate for toxicity before each dose. For grade 2 or higher toxicity, hold until toxicity recovers to grade 1 or less (or pretreatment grade level). Dose modifications depend on duration of dosing interruption as follows: ***Less than 7 days (within a cycle):*** Hold the next dose; maintain a minimum of 6 days between doses; ***7 days or greater:*** omit the next dose within the cycle; ***14 days or greater:*** After recovery, decrease the total dose by 25% for the subsequent cycle. If further dose modification is required, reduce the number of doses to 2 per cycle for subsequent cycles. If a 25% decrease in the total dose followed by a decrease to 2 doses per cycle is not tolerated, permanently discontinue therapy; ***greater than 28 days:*** consider permanent discontinuation

## Hepatic dose

*Baseline hepatic impairment*: No change

**Treatment-related hepatotoxicity:**

Evaluate for toxicity before each dose. Dosing interruptions within a cycle are recommended for hepatic impairment. If a dose reduction is necessary, do not re-escalate the dose. *Total bilirubin level of 1.5 times the upper limit of normal (ULN) or less and AST/ALT level of 2.5 times the ULN or less:* No dose adjustment is necessary. *Total bilirubin level greater than 1.5 times the ULN and AST/ALT level greater than 2.5 times the ULN:* Hold therapy until the total bilirubin level is 1.5 times the ULN or less and the AST/ALT level is 2.5 times the ULN or less unless hyperbilirubinemia is due to Gilbert's syndrome or hemolysis. Dose modifications depend on duration of dosing interruption as follows: *Less than 7 days (within a cycle):* Hold the next dose; maintain a minimum of 6 days between doses. *7 days or greater:* Omit the next dose within the cycle; *14 days or greater:* After recovery, decrease the total dose by 25% for the subsequent cycle. If further dose modification is required, reduce the number of doses to 2 per cycle for subsequent cycles. If a 25% decrease in the total dose followed by a decrease to 2 doses per cycle is not tolerated, permanently discontinue; *greater than 28 days:* Permanently discontinue

**Hepatic venoocclusive disease (VOD)/sinusoidal obstruction syndrome (SOS) or other severe liver toxicity:** Permanently discontinue

**Available forms:** Powder for injection 0.9 mg

### Implementation

#### IV route

- Visually inspect for particulate matter and discoloration before use
- Follow cytotoxic handling procedures
- Available as a single-dose, preservative-free, 0.9-mg lyophilized powder vial
- Premedication with a corticosteroid, an antipyretic agent (acetaminophen), and an antihistamine before each dose is recommended; observe patients during and for at least 1 hr after the end of the infusion for symptoms of infusion-related reactions

### Reconstitution

- After calculating the number of vials needed, add 4 ml of sterile water for injection to each vial for a final vial concentration of 0.25 mg/ml (0.9 mg/3.6 ml); gently swirl the vial to dissolve powder, do not shake
- The reconstitution solution should be clear to opalescent, colorless to slightly yellow, and free of visible foreign matter
- **Storage of reconstituted vials:** If not further diluted immediately, vials may be stored in the refrigerator (at 2 to 8° C or 36 to 46° F) for up to 4 hr after reconstitution; protect from light, do not freeze

### Dilution

- Add the required dose/volume from the reconstituted vials to an infusion container made of polyvinyl chloride (PVC) or non-DEHP-containing polyolefin (polypropylene and/or polyethylene), or ethylene vinyl acetate (EVA); discard any unused portion
- Add 0.9% sodium chloride injection to the infusion container for a final total volume of 50 ml; gently invert to mix, do not shake
- **Storage of admixture:** If not infused immediately, the diluted solution may be stored at room temperature (20 to 25° C or 68 to 77° F) for up to 4 hr or refrigerated (2 to 8° C or 36 to 46° F) for up to 3 hr; protect from light and do not freeze

### IV infusion

- Allow refrigerated admixtures to warm to room temperature for 1 hr before use
- Give admixture (protected from light) as an IV infusion over 1 hr through an infusion line made of PVC, polyolefin (polypropylene and/or polyethylene), or polybutadiene
- Complete infusion within 8 hr of reconstitution
- The diluted solution does not need to be filtered; if it is filtered, use polyethersulfone (PES)-, polyvinylidene fluoride (PVDF)-, or hydrophilic polysulfone (HPS)-based filters
- Do not use filters made of nylon or mixed cellulose ester (MCE)
- Do not mix with or administer as an infusion with other drugs

## ADVERSE EFFECTS

**CNS:** *Fatigue, fever, headache, migraine, chills*

**GI:** *Nausea, vomiting, diarrhea, stomatitis, constipation, anorexia, abdominal pain,* hepatotoxicity

**HEMA:** Anemia, thrombocytopenia, *bleeding, hematoma, hematuria, ecchymosis, venoocculsive disease*

**MISC:** Infection, asthenia, QT prolongation, tumor lysis syndrome, sinusoidal obstruction syndrome

### Pharmacokinetics

| | |
|---|---|
| **Absorption, metabolism, excretion, half-life** | Unknown |
| **Distribution** | Protein binding 97% |

### Pharmacodynamics

| | |
|---|---|
| **Onset, peak, duration** | Unknown |

## INTERACTIONS

Other products that increase QT prolongation: Increased QT prolongation

### Drug/lab test

Increased LFTs

## NURSING CONSIDERATIONS

### Assessment

- **Serious infection**: Some may be fatal. Monitor patients for signs and symptoms of infection; use prophylactic antiinfectives as appropriate
- **Severe myelosuppression/bone marrow suppression:** Assess for thrombocytopenia, neutropenia; obtain a CBC before each dose, therapy interruption or permanent discontinuation may be necessary in patients who develop severe myelosuppression
- **Pregnancy/breastfeeding:** Product can cause fetal harm, females of reproductive potential should avoid becoming pregnant during and for 8 mo after final dose; obtain a pregnancy test before starting product, do not breastfeed during and for at least 2 mo

after the last dose; men with female partners of reproductive potential should avoid fathering a child and use effective contraception during and for at least 5 mo after therapy

• **QT prolongation**: Obtain an electrocardiogram (ECG) and monitor serum electrolytes before the start of treatment and periodically during therapy as needed. Use with caution in patients with a history of QT prolongation or who have an electrolyte imbalance. Avoid concomitant use with other drugs known to prolong the QT interval; if coadministration is unavoidable, monitor ECGs and serum electrolytes after starting the other QT-prolonging drug. Females, geriatric patients, patients with diabetes mellitus, thyroid disease, malnutrition, alcoholism, hepatic dysfunction, or patients who have received high-cumulative-dose anthracycline therapy may also be at increased risk for QT prolongation

**BLACK BOX WARNING: Severe or life-threatening** hepatotoxicity, including venoocclusive disease (VOD)/sinusoidal obstruction syndrome (SOS): Monitor liver function tests (LFTs), total bilirubin, alkaline phosphatase levels before and after each dosage change; therapy interruption, dose reduction, or permanent discontinuation may be necessary in those who develop liver function test abnormalities. Closely monitor for VOD/SOS (hepatomegaly, rapid weight gain, and ascites). Permanently discontinue in those who develop VOD/SOS; in those who undergo a hematopoietic stem cell transplant (HSCT), monitor LFTs frequently during the first month post-HSCT; then continue to monitor LFTs but less often. Time from HSCT to onset of VOD/SOS was 15 days (range 3 to 57 days). The risk of VOD/SOS may be greater in patients who receive an HSCT or a conditioning regimen that contains 2 alkylating agents before HSCT and in patients who have an increased total bilirubin level before a HSCT; other risk factors include hepatic disease (e.g., cirrhosis, nodular regenerative hyperplasia, active hepatitis), a prior HSCT, increased age, later salvage lines, and a larger number of treatment cycles

**BLACK BOX WARNING: Mortality:** Those who underwent a hematopoietic stem cell transplant (HSCT) may have a higher 100-day post-HSCT nonrelapse mortality; monitor closely for post-HSCT toxicity. The most common causes of post-HSCT death were venoocclusive disease/sinusoidal obstruction syndrome and infectious complications

### Patient/family education

• Teach patient to report adverse reactions immediately, bleeding; report diarrhea, hepatic, hematologic symptoms/toxicity, flulike symptoms

• Teach patient about reason for treatment, expected results

• **Pregnancy/breastfeeding:** Teach patient to notify provider if pregnancy is planned or suspected, to use effective contraception during treatment and for 8 mo after discontinuing treatment, breastfeeding or for 2 mo after final dose; men with female partners of reproductive potential should be cautioned to avoid fathering a child and use effective contraception during and for at least 5 mo after therapy

### Evaluation

**Positive therapeutic outcome**

• Improving blood counts

## RARELY USED

## L-glutamine

**Endari**

*Func. class.:* Functional bowel agents, hematological agents

**USES:** For the treatment of short bowel syndrome in patients receiving specialized nutritional support in conjunction with recombinant human growth hormone; for the treatment of sickle cell disease

## DOSAGE AND ROUTES

### For the treatment of short bowel syndrome in patients receiving specialized nutritional support in conjunction with recombinant human growth hormone

**Adult: PO** 5 g (1 packet) 6 times/day for up to 16 wk given in conjunction with a specialized diet adjusted for individual patient requirements and preferences. Recombinant human growth hormone (rh-GH) should be given during the first 4 wk of therapy

### To reduce the acute complications of sickle cell disease

**Adult: > 65 kg PO** 15 g (3 packets) bid; 30 to 65 kg 10 g (2 packets) bid

**Child and Adolescent:** 5 to 17 yr and >65 kg 15 g (3 packets) **bid**; 30 to 65 kg 10 g (2 packets) **bid**; <30 kg 5 g (1 packet) **bid**

## lesinurad/allopurinol (Rx)

(le-sin'-ure-ad/al-oh-pure'i-nole)

**Duzallo**

*Func. class.:* Antigout agent, antihyperuricemic

*Chem. class.:* Xanthine oxidase inhibitor

**ACTION:** Inhibits the enzyme xanthine oxidase, reducing uric acid synthesis

**USES:** For the treatment of hyperuricemia associated with gout

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, renal/hepatic disease

## DOSAGE AND ROUTES

**For the treatment of hyperuricemia associated with gout in patients not achieving target serum uric acid levels with allopurinol alone**

**Adult: PO** 1 tablet (lesinurad 200 mg; allopurinol 300 mg) qday in those who have not achieved target serum uric acid on allopurinol 300 mg/day or more

### Renal dose

**Adult:** CCr less than 45 ml/min: Use not recommended

**Available forms:** Tabs 200 mg-200 mg, 200 mg-300 mg

### Implementation

**PO route**

- Give in the a.m. with food and water
- To provide adequate hydration (drink 2 liters [68 ounces] of fluid daily)
- Do not discontinue if a gout flare occurs during treatment; the flare can be managed concurrently as appropriate for the individual patient
- Missed dose: Do not take a missed dose later in the day. Wait to take on the next day; do not double the dose

## INTERACTIONS

### Individual drugs

Ammonium chloride, vit C, potassium/sodium phosphate: Increase: kidney stone formation—Ampicillin, amoxicillin: Increase: rash, avoid concurrent use

Rasburicase: Increase xanthine nephropathy, calculi

### Drug categories

Oral anticoagulants, oral antidiabetics, theophylline: Increased action of each product

ACE inhibitors, thiazides: Increased hypersensitivity, toxicity

Antineoplastics (mercaptopurine, azaTHIOprine): Increased bone marrow depression

## SIDE EFFECTS

**CNS:** Headache

**GI:** Nausea, vomiting, malaise, cramps, diarrhea

**INTEG:** Rash

**MS:** Acute gouty attack

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Allopurinol: Protein binding < 1 %; lesinurad: highly bound to plasma proteins |
| Metabolism: **Lesinurad:** Metabolized via oxidation CYP2C9 | |
| **Excretion** | Allopurinol: Excreted in feces, urine |
| **Half-life** | Allopurinol: 1-2 hr; lesinurad: 5 hr |

### Pharmacodynamic

| | |
|---|---|
| **Onset, duration** | Unknown |
| **Peak** | Allopurinol: 1.5 hr |

## NURSING CONSIDERATIONS

### Assessment

- **Gout: Assess** for joint pain, swelling; may use with NSAIDs for acute gouty attacks; uric acid levels q2wk; uric acid levels should be ≤ 6 mg/dl, effect may take several weeks
- Monitor CBC, AST, BUN, creatinine, prothrombin time/INR, before starting treatment, periodically; prothrombin time/INR should be reassessed periodically in patients receiving coumarin anticoagulant therapy
- Monitor I&O ratio; increase fluids to 2 L/day prevent stone formation and toxicity
- Assess for rash, hypersensitivity reactions, discontinue product
- **Hepatic disorder:** Monitor LFTs baseline and periodically, assess for abdominal pain, jaundice of skin, eyes
- **Bone marrow suppression:** Usually in those who have received concomitant drugs that may cause this reaction, may occur 6 wk to 6 yr after starting allopurinol
- **Pregnancy/breastfeeding:** Use only if needed, no well-controlled studies, use cautiously in breastfeeding

### Patient/family education

- Teach patient to avoid hazardous activities if drowsiness or dizziness occurs

• Teach patient to avoid alcohol, caffeine; will increase uric acid levels
• Teach patient to avoid large doses of vit C; kidney stone formation may occur
• Teach patient to reduce dairy products, refined sugars, sodium, meat if taking for calcium oxalate stones
• Advise patient to take as prescribed; if dose is missed, take as soon as remembered; do not double dose; tabs may be crushed
• Advise patient to increase fluid intake to 2 L/day
• Teach patient to report skin rash, stomatitis, malaise, fever, aching; product should be discontinued

### Evaluation

**Positive therapeutic outcome**

• Decreased pain in joints, decreased stone formation in kidneys, decreased uric acid levels

## RARELY USED

## letermovir

(le- term- oh- vir)

**Prevymis**

*Func. class.:* Antiviral

**USES:** For the prevention of cytomegalovirus after allogenic hematopoietic stem cell transplant

## DOSAGE AND ROUTES

**For cytomegalovirus (CMV) disease prophylaxis in CMV-seropositive recipients [R+] or an allogeneic hematopoietic stem cell transplant (HSCT) without concurrent cyclosporine**

**Adult: PO/IV** 480 mg qday started between day 0 and day 28 posttransplantation (before or after engraftment) and continued through day 100 posttransplantation

**For cytomegalovirus (CMV) disease prophylaxis in patients with concurrent cyclosporine**

**Adult: PO/IV** 240 mg qday started between day 0 and day 28 posttransplantation (before or after engraftment) and continued through day 100 posttransplantation. If cyclosporine is initiated after starting letermovir, reduce letermovir to 240 mg with the next dose. If cyclosporine is discontinued after starting letermovir, increase the dose of letermovir to 480 mg. If cyclosporine dosing is interrupted due to high cyclosporine concentrations, no dosage adjustment of letermovir is needed

## meropenem/vaborbactam (Rx)

(mer-oh-pen′em/va bor bak′ tam)

**Vabomere**

*Func. class.:* Antiinfective—miscellaneous

*Chem. class.:* Carbapenem

**ACTION:** Bactericidal; interferes with cell wall replication of susceptible organisms

**USES:** For the treatment of complicated urinary tract infections caused by *Citrobacter* freundii, *Citrobacter koseri*, *Enterobacter aerogenes*, *Enterobacter cloacae*, *Escherichia coli*, *Klebsiella oxytoca*, *Klebsiella pneumoniae*, *Morganella morganii*, *Proteus mirabilis*, *Providencia* spp., *Pseudomonas aeruginosa*, *Serratia marcescens*

## CONTRAINDICATIONS

Hypersensitivity to this product, carbapenems

**Precautions:** Pregnancy, breastfeeding, geriatric patients, renal disease, seizure disorder, gram-negative infection, pneumonia, hypersensitivity to cephalosporins, penicillins

## DOSAGE AND ROUTES

**For the treatment of complicated urinary tract infection (UTI), including pyelonephritis**

**Adult: IV:** 4 g (2 g meropenem and 2 g vaborbactam) q8hr for up to 14 days

### Renal dose

**Adult:** IV; eGFR 50 ml/min/1.73 $m^2$ or more: No change; eGFR 30 to 49 ml/min/1.73 $m^2$: 2 g (1 g meropenem and 1 g vaborbactam) q8hr; eGFR 15 to 29 ml/min/1.73 $m^2$: 2 g (1 g meropenem and 1 g vaborbactam) q12hr; eGFR less than 15 ml/min/1.73 $m^2$: 1 g (0.5 g meropenem and 0.5 g vaborbactam) q12hr

**Intermittent hemodialysis:** Meropenem and vaborbactam are removed by hemodialysis, give appropriate renal dose of meropenem; vaborbactam after hemodialysis

**Available forms:** Powder for injection 2 g

### Implementation

**IV route**

• Visually inspect for particulate matter and discoloration before use

### Reconstitution

• Constitute the appropriate number of vials as needed for the dose
  • 2 vials are used for 4 g (2 g meropenem and 2 g vaborbactam) dose

- 1 vial is used for 2 g (1 g meropenem and 1 g vaborbactam) or 1 g (0.5 g meropenem and 0.5 g vaborbactam) doses

• Withdraw 20 ml of 0.9% sodium chloride Injection from an infusion bag and constitute each vial
- For 4 g (2 g meropenem and 2 g vaborbactam) dose/250 to 1000 ml
- For 2 g (1 g meropenem and 1 g vaborbactam) dose/125 to 500 ml
- For 1 g (0.5 g meropenem and 0.5 g vaborbactam) dose 70 to 250 ml

• Mix gently to dissolve. The constituted solution is concentrations of 0.05 g/ml meropenem and 0.05 g/ml vaborbactam; the final volume is 21.3 ml
• Further dilute before use; do not use by direct injection

### Dilution
• Withdraw the full or partial constituted vial contents from each vial and add back into the 0.9% sodium chloride Injection infusion bag
• The final concentration of meropenem and vaborbactam will be between 2 and 8 mg/ml
• ***Storage:*** Complete infusion within 4 hr if stored at room temperature or 22 hr if refrigerated at 2 to 8° C (36 to 46° F)

### Intermittent IV infusion
• Give over 3 hr

## ADVERSE EFFECTS
**CNS:** Seizures, dizziness, weakness, headache, insomnia, agitation, confusion, drowsiness

**CV:** Hypotension, tachycardia

**ENDO:** Hypoglycemia

**GI:** Diarrhea, nausea, vomiting, pseudomembranous colitis, hepatitis, glossitis, jaundice

**INTEG:** Rash, urticaria, pruritus, pain at inj site, phlebitis, erythema at inj site

**RESP:** Dyspnea, hyperventilation, cough, sputum

**SYST:** Anaphylaxis, Stevens-Johnson syndrome, angioedema

### Pharmacokinetics

| | |
|---|---|
| **Distribution** | Protein binding 2% (meropenem), 33% (vaborbactam) |
| **Metabolism** | Meropenem is a substrate of OAT1 and OAT3 transporters, use after hemodialysis |
| **Excretion** | Kidneys |
| **Half-life** | 1.22 hr (meropenem), 1.68 hr (vaborbactam) |

### Pharmacodynamics

| | |
|---|---|
| **Onset, peak, duration** | Unknown |

## INTERACTIONS
### Individual drugs
Probenecid: Increased meropenem levels
Valproic acid: Increased effect of this agent

### Drug/lab test
Increase: AST, ALT, LDH, BUN, alk phos, bilirubin, creatinine
Decrease: Prothrombin time
False positive: Direct Coomb's test

## NURSING CONSIDERATIONS
### Assessment
• Assess for sensitivity to carbapenem antibiotics, penicillins, cephalosporins
• Renal disease: Lower dose may be required; monitor serum creatinine/BUN sodium, before, during therapy
• **Pseudomembranous colitis:** Assess bowel pattern daily; if severe diarrhea, abdominal pain, fatigue occurs, product should be discontinued
• **Infection**: Assess temperature, sputum, characteristics of wound before, during, and after treatment
• **Allergic reactions, anaphylaxis:** Assess for rash, laryngeal edema, wheezing, urticaria, pruritus; may occur immediately or several days after therapy begins; identify if there has been hypersensitivity to penicillins, cephalosporins, beta-lactams, cross-sensitivity may occur
• Seizures: May occur in those with brain lesions, seizure disorder, bacterial meningitis, or renal disease; stop product and notify prescriber if seizures occur
• Overgrowth of infection: Assess for perineal itching, fever, malaise, redness, pain, swelling, drainage, rash, diarrhea, change in cough, sputum

### Patient/family education
• **Pseudomembranous colitis:** Teach patient to report severe diarrhea
• Advise patient to report sore throat, bruising, bleeding, joint pain, may indicate blood dyscrasias (rare)
• Teach patient to report overgrowth of infection: Black furry tongue, vaginal itching, foul-smelling stools

### Evaluation
#### Positive therapeutic outcome
• Negative C&S; absence of symptoms and signs of infection

**⚠ HIGH ALERT**

**RARELY USED**

## midostaurin

(mye-doe-staw′-rin)

**Rydapt**

*Func. class.:* Antineoplastic

**USES:** For the treatment of newly diagnosed, FLT3 mutation-positive AML in combination with standard cytarabine and daunorubicin induction and consolidation therapy and for the treatment of aggressive systemic mastocytosis, systemic mastocytosis with associated hematological neoplasm, or mast cell leukemia

### DOSAGE AND ROUTES

**For the treatment of newly diagnosed, FLT3 mutation-positive AML in combination with standard cytarabine and daunorubicin induction and consolidation therapy**

**Adult: PO** 50 mg bid on days 8 to 21 of each cycle of induction therapy with cytarabine and daunorubicin; additionally, give midostaurin 50 mg bid on days 8 to 21 of each cycle of consolidation with high-dose cytarabine therapy

**For the treatment of aggressive systemic mastocytosis, systemic mastocytosis with associated hematological neoplasm, or mast cell leukemia**

**Adult: PO** 100 mg bid until disease progression

## neratinib

(ne-ra′-ti-nib)

**Nerlynx**

*Func. class.:* Antineoplastic

*Chem. class.:* Protein kinase inhibitors

**ACTION:** It is an irreversible inhibitor of the epidermal growth factor receptor (EGFR) and the human epidermal receptor type 2 (HER2) and HER4. It is a protein kinase inhibitor

**USES:** For the extended adjuvant treatment of early stage HER2-positive breast cancer, after completion of adjuvant trastuzumab

### CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Breastfeeding, contraception requirements, geriatric, hepatic disease, hepatotoxicity, infertility, pregnancy, pregnancy testing, reproductive risk

### DOSAGE AND ROUTES

**For the extended adjuvant treatment of early stage HER2-positive breast cancer, after completion of adjuvant trastuzumab-based therapy**

**Adult: PO** 240 mg qday with food, × 1 yr

### Therapeutic drug monitoring

**Dosage adjustments for treatment-related toxicities:**

Interrupt therapy per specific instructions. Restart as appropriate at the following reduced doses: **Starting dose:** 240 mg qday; **first dose reduction**: 200 mg qday; **second dose reduction:** 160 mg qday; **third dose reduction:** 120 mg qday

- ***Diarrhea:*** Antidiarrheal prophylaxis (loperamide) is recommended during the first 2 cycles (56 days); additional antidiarrheals may be needed
- ***Grade 1 to 3, with complicating features (dehydration, fever, hypotension, renal failure, or grade 3 or 4 neutropenia):*** Hold, modify diet, and give fluids of 2 L; if IV fluids are needed for grade 3 diarrhea, evaluate LFTs with fractionated bilirubin and prothrombin time; when diarrhea resolves to < grade 1 or baseline, give loperamide 4 mg with each dose. If diarrhea resolves to < grade 1 in 1 wk or less, resume the same dose. If resolution to ≤ grade occurs after 1-3 wk, resume at the next lower dose. Discontinue if diarrhea does not recover to ≤ grade 1, if diarrhea results in a treatment delay of >3 wk, or for those unable to tolerate 120 mg daily
- ***Grade 1 (increase of <4 stools/day over baseline), no complicating features:*** Continue, adjust antidiarrheals, modify diet. Give fluids of 2 L when diarrhea resolves to < grade 1 or baseline, give loperamide 4 mg with each subsequent dose.
- ***Grade 2 (increase of 4 to 6 stools per day over baseline), no complicating features:*** Continue, adjust antidiarrheals, and modify diet. Maintain fluid intake of 2 L; if grade 2 diarrhea lasts for ≥ 5 days even with optimal medical therapy, hold; when diarrhea resolves to < grade 1 or baseline, give loperamide 4 mg with each dose; if diarrhea resolves to < grade 1 in ≤ 1 wk, resume at the same dose. If resolution to ≤ grade 1 occurs after 1-3 wk, resume the next lower dose. Discontinue if diarrhea does not recover to ≤ grade 1, if diarrhea results in a delay of more than 3 wk, or if grade 2 or higher diarrhea recurs at 120 mg/day

• ***Grade 3 (increase of greater than or equal to 7 stools per day over baseline; incontinence; hospitalization indicated; limiting self-care activities of daily living), no complicating features:*** Continue, adjust antidiarrheals, modify diet. Maintain fluid intake of 2 L; if IV fluids are required, evaluate LFTs including fractionated bilirubin and prothrombin time. If grade 3 diarrhea lasts for ≥ 2 days, hold product. When diarrhea resolves to less than grade 1 or baseline, administer loperamide 4 mg with each subsequent neratinib dose. If diarrhea resolves to less than grade 1 in 1 wk or less, resume neratinib treatment at the same dose. If resolution to grade 1 or less occurs after 1 to 3 wk, resume neratinib treatment at the next lower dose. Discontinue neratinib treatment if diarrhea does not recover to grade 1 or less, if diarrhea results in a treatment delay of more than 3 wk, or if grade 2 or higher diarrhea recurs at 120 mg per day

• ***Grade 4 (life-threatening consequences; urgent intervention required):*** Permanently discontinue; if IV fluids are required, evaluate liver function tests, including fractionated bilirubin and prothrombin time

### Hepatic dose

**Adult:** PO *Child-Pugh A or B:* No change: *Child-Pugh C:* Reduce starting dose to 80 mg qday; *grade 3 elevations in ALT (5 to 20 X ULN) or bilirubin (3 to 10 X ULN):* Hold and evaluate causes; first occurrence, if LFTs resolve to ≤ to grade 1 (ALT ≤ to 3 X ULN or bilirubin ≤ I to 1.5 X ULN) in≤3wk, resume at the next lower dose, discontinue if hepatotoxicity does not recover to ≤ 1, if hepatotoxicity results in a treatment delay of > 3 wk, or if grade 3 ALT or bilirubin occurs again despite one dose reduction; *grade 4 elevations in ALT (> 20 X ULN) or bilirubin (> 10 X ULN):* Permanently discontinue

**Available forms:** Tablet 40 mg

**Implementation:** Take with food at the same time every day

• Swallow tablets whole; do not chew, crush, or split

• If a dose is missed, do not replace the missed dose. Resume with the next scheduled daily dose

- Antidiarrheal prophylaxis is recommended during the first 2 cycles (56 days) of treatment and should be initiated with the first dose of neratinib; loperamide should be taken as directed next, titrating to 1 to 2 bowel movements/day; additional antidiarrheal agents may be required to manage patients with loperamide-refractory diarrhea

• Weeks 1 to 2 (days 1 to 14): Take loperamide 4 mg tid

• Weeks 3 to 8 (days 15 to 56): Take loperamide 4 mg bid

• Weeks 9 to 52 (days 57 to 365): Take loperamide 4 mg as needed (max 16 mg/day)

## ADVERSE EFFECTS

**GI:** *Diarrhea, abdominal pain, anorexia, nausea, vomiting*

**GU: Renal failure(rare)**

**INTEG:** *Rash*

**MS:** *Muscle cramps*

**MISC:** Infection

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding >99%; |
| **Metabolism** | Liver by CYP3A4, avoid with strong and moderate CYP3A4 inhibitors and inducers |
| **Excretion** | Fecal excretion 97.1% |
| **Half-life** | After 7 days was 14.6 hr half-life of active metabolites 21.6 hr, 13.8 hr, 10.4 hr, respectively |

## INTERACTIONS

Gastric acid reducing agents: void concomitant use with proton pump inhibitors (PPI) and H2-receptor antagonists, decreased effect, separate by 3 hr after antacid dosing

Strong or moderate CYP3A4 inhibitors: Increased neratinib effect, avoid concomitant use

Strong or moderate CYP3A4 inducers: Decreased neratinib effect, avoid concomitant use

P-glycoprotein (P-gp) substrates: Increased CNS and CV adverse reactions, monitor for adverse reactions of narrow therapeutic agents that are P-gp substrates

## NURSING CONSIDERATIONS

### Assessment

• **Hepatotoxicity:** Use with caution in those with preexisting hepatic disease; a dose reduction is required for patients with severe (Child-Pugh C) hepatic disease at baseline. Monitor LFTs (total bilirubin, AST, ALT, alkaline phosphatase) baseline, q mo X 3 mo and then q3mo thereafter and as needed. Monitor LFTs (including fractionated bilirubin and prothrombin time) in those experiencing grade 3 diarrhea or any signs of hepatotoxicity (fatigue, nausea, vomiting, right upper quadrant tenderness, fever, rash, eosinophilia)

• **Geriatrics** >65 yr: Monitor geriatric patients more closely for toxicities (vomiting, diarrhea, renal failure, dehydration) during treatment

• **Infection:** May occur after completion of adjuvant trastuzumab-based therapy, assess for urinary tract infection, cellulitis, and erysipelas
• **Pregnancy/breastfeeding:** Avoid by females of reproductive potential during treatment and for at least 1 mo after the last dose, can cause fetal harm or death when used during pregnancy; discontinue breastfeeding during treatment and for 1 mo after the final dose. It is not known whether present in breast milk. Obtain a pregnancy test before starting treatment. Males with female partners of reproductive potential should avoid pregnancy and use effective contraception during and ≥ 3 mo after the last dose

### Patient/family education

• *Infection:* May occur; to report urinary pain, hesitancy, skin redness, pain, heat; fever, shaking, chills
• **Pregnancy/breastfeeding:** Not to be used in pregnancy, breastfeeding, contraception should be used during and for at least 1 mo after last dose, men with a partner that may become pregnant should use contraception during and for at least 3 mo after last dose

### Evaluation

**Positive therapeutic outcome**
Decrease in size of cancerous tumor

**⚠ HIGH ALERT**

**RARELY USED**

## niraparib

(nye-rap'-a-rib)
**Zejula**
*Func. class.:* Antineoplastic

**USES:** For the treatment of recurrent epithelial ovarian, fallopian tube, or primary peritoneal cancer

## DOSAGE AND ROUTES

**Adult: PO** 300 mg qday until disease progression or unacceptable toxicity. Begin therapy no later than 8 wk after the last platinum-containing regimen

## ribociclib

(rye-boe-sye'-klib)
**Kisqali**
*Func. class.:* Antineoplastic
*Chem. class.:* Protein kinase inhibitors

**ACTION:** A cyclin-dependent kinase (CDK) 4 and 6 inhibitor. Regulates cell cycle progression through phosphorylation of the retinoblastoma protein. The combination of ribociclib and an antiestrogen such as letrozole inhibited tumor growth more than either agent alone. It is a protein kinase inhibitor

**USES:** For the initial endocrine-based treatment of hormone receptor (HR)-positive, HER2-negative advanced or metastatic breast cancer in combination with an aromatase inhibitor in postmenopausal women

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Breastfeeding, contraception requirements, hepatic disease, hepatotoxicity, infertility, neutropenia, pregnancy, pregnancy testing, reproductive risk, thromboembolic disease

## DOSAGE AND ROUTES

**For the initial endocrine-based treatment of hormone receptor (HR)-positive, HER2-negative advanced or metastatic breast cancer in combination with an aromatase inhibitor in postmenopausal women**
**Adult:** 600 mg qday on days 1 to 21, followed by 7 days of rest, in combination with letrozole (2.5 mg daily) or another aromatase inhibitor on days 1 to 28; repeat cycle q28days

**Available forms:** Tablets 200, 400, 600 mg

### Therapeutic drug monitoring

**Neutropenia:**
• ***ANC ≥ 1,000 cells/mm³ (grade 2 or less):*** No change
• ***ANC 500 cells/mm³ to 999 cells/mm³ (grade 3):*** Hold. For the first occurrence of grade 3 neutropenia, resume at the original dose level when the ANC returns to ≥ 1000 cells/mm³ (grade 2 or less); for recurrent grade 3 neutropenia, resume at the next lower dose level (reduce 600 mg to 400 mg; reduce 400 mg to 200 mg). If further dose reduction below 200 mg per day is required, discontinue
• ***ANC <500 cells/mm³ (grade 4):*** Hold. Resume at the next lower dose level when the ANC returns to ≥ 1000 cells/mm³ (grade 2 or less) (reduce 600 mg to 400 mg; reduce 400 mg to 200 mg). If further dose reduction below 200 mg per day is required, discontinue

**Neutropenic fever**
• ***ANC 500 cells/mm³ to 999 cells/mm³ (grade 3 neutropenia) with single episode of fever >38.3°C (or) above 38°C for more than 1 hr and/or concurrent infection:*** Hold, resume at the next lower dose level when the ANC returns to ≥ 1000 cells/mm³ (grade 2 or less) (reduce 600 mg to 400 mg; reduce 400 mg to 200 mg). If further dose reduction below 200 mg per day is required, discontinue

**QT prolongation**

• ***QTcF 481 to 500 msec and no serious arrhythmia:*** Hold, monitor ECG frequently. For the first occurrence, resume at the same dose when QTcF prolongation resolves to ≤480 msec; for a recurrence of QTcF >480 msec, resume at the next lower dose level (reduce 600 mg to 400 mg; reduce 400 mg to 200 mg). If further dose reduction below 200 mg per day is required, discontinue

• ***QTcF greater than 500 msec and no serious arrhythmia:*** Repeat ECG. If the QTcF >500 msec on at least 2 separate ECGs at the same visit, hold; monitor ECG more frequently. Resume at the next lower dose level (reduce 600 mg to 400 mg; reduce 400 mg to 200 mg) when QTcF prolongation resolves to ≤480 msec. If further dose reduction below 200 mg per day is required, discontinue

• ***QTcF >500 msec OR >60 msec change from baseline AND associated with torsades de pointes, polymorphic ventricular tachycardia, unexplained syncope, or signs/symptoms of serious arrhythmia:***

**Hepatic dose**

• *Mild hepatic impairment (Child-Pugh class A):* No change; *moderate to severe hepatic impairment (Child-Pugh class B or C):* Reduce the starting dose to 400 mg qday

• *AST/ALT greater than ULN to 3 times ULN (grade 1); total bilirubin less than 2 times ULN:* No change

• *AST/ALT 3.01 to 5 times ULN (grade 2); total bilirubin less than 2 times ULN:* If baseline hepatic impairment was grade 2, continue; monitor LFTs more frequently. If baseline was grade 0 or 1, hold. For the first occurrence of grade 2 hepatotoxicity, resume treatment at original dose, when AST/ALT resolve ≤ to baseline. For recurrent grade 2 hepatotoxicity, resume at the next lower dose level (reduce 600 mg to 400 mg; reduce 400 mg to 200 mg), monitor LFTs more frequently. If further dose reduction below 200 mg/day is required, discontinue

• *AST/ALT greater than 3 times ULN (greater than grade 2); total bilirubin GREATER than 2 times ULN (irrespective of baseline; in the absence of cholestasis):* Discontinue *AST/ALT 5.01 to 20 times ULN; (grade 3); total bilirubin less than 2 times ULN:* Hold. For the first occurrence of grade 3 hepatotoxicity, resume at the next lower dose level when AST/ALT recover to ≤ baseline grade (reduce 600 mg to 400 mg; reduce 400 mg to 200 mg). monitor LFTs more frequently. If further dose reduction below 200 mg per day is required, discontinue. Discontinue for recurrent grade 3 hepatotoxicity

• *AST/ALT greater than 20 times ULN (grade 4); total bilirubin less than 2 times ULN:* Discontinue

**Nephrotoxicity dosage adjustments**

***Serum creatinine (SCr) less than or equal to 3 times the upper limit of normal (ULN) or glomerular filtration rate (GFR) greater than or equal to 25% of the lower limit of normal (LLN) (grade 1 or 2):*** No change

***SCr 3.01 to 6 times ULN or GFR less than 25% of LLN (chronic dialysis not indicated) (grade 3):*** Hold. For the first occurrence of a grade 3, resume at the original dose ≤ grade 1; for a recurrent grade 3, resume at the next lower dose level (reduce 600 mg to 400 mg; reduce 400 mg to 200 mg). If further dose reduction below 200 mg per day is required, discontinue

***SCr greater than 6 times ULN or requiring chronic dialysis or renal transplant (grade 4):*** Discontinue

### Implementation

• Take ribociclib and letrozole at the same time every day, preferably in the morning

• Swallow tablets whole; do not chew, crush, or split. Not to take if broken, cracked

• If a dose is missed, or if the patient vomits, do not replace the missed dose. Resume with the next scheduled daily dose

## ADVERSE EFFECTS

**CV:** QT prolongation, peripheral edema

**GI:** Diarrhea, abdominal pain, anorexia, nausea, vomiting, constipation, stomatitis, weight loss

**CNS:** Fatigue, headache, insomnia

**MS:** Back pain

**Dermatologic:** *Alopecia, skin rash, pruritus*

**HEMA:** Leukemia, neutropenia

**MISC:** Infection

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Protein binding 70% |
| **Metabolism** | Extensively metabolized (CYP3A4) |
| **Excretion** | Unchanged drug 17% and 12% in feces and urine, respectively, |
| **Half-life** | 29.7-54.7 hr\fecal excretion 97.1% |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 1-4 hr |
| **Duration** | Unknown |

## INTERACTIONS

Drugs known to prolong QT interval: Increased QT prolongation, avoid concomitant use
Strong or moderate CYP3A4 inhibitors- Increased ribociclib effect, avoid concomitant use, if cannot be avoided, reduce dose
Strong or moderate CYP3A4 inducers: Decreased ribociclib effect, avoid concomitant use

### Drug/lab test

Increase: LFTs

### Drug/food

To avoid pomegranate/pomegranate juice, and grapefruit/ grapefruit juice
Nursing considerations
Assessment
• **Hepatotoxicity:** Including elevated transaminases with or without an elevation in total bilirubin, may occur in combination therapy with ribociclib plus letrozole. The median time to onset of ≥ grade 3 transaminase elevations was 57 days, with a median time to resolution to grade 2 or less of 24 days. Monitor LFTs baseline, q2wk for the first 2 cycles, before the next 4 cycles, and then as needed. A dose interruption, reduction, or discontinuation of therapy may be necessary. Use with caution in those with baseline hepatic disease; reduce dose in Child-Pugh class B or C hepatic disease
• **Bone marrow suppression:** Neutropenia is the most frequent. The median time to onset of grade 2 or higher neutropenia was 16 days, with the median time to resolution (to normalization or grade <3) of 15 days. Monitor a CBC baseline, q2wk for the first 2 cycles, before the next 4 cycles, and then as needed. A dose interruption, reduction, or discontinuation of therapy may be needed in those with an absolute neutrophil count (ANC) <1000 cells/mm$^3$;
• **Long QT syndrome:** Avoid the use in long QT syndrome, uncontrolled or significant cardiac disease (cardiac arrhythmias, recent MI, heart failure, unstable angina, bradycardia or bradyarrhythmias), electrolyte imbalance (hypomagnesemia, hypokalemia, hypocalcemia), with products causing prolonged QT interval or strongly inhibit CYP3A4, as this may lead to prolongation of the QTcF interval. Use with caution in conditions that increase the risk of QT prolongation (hypertension, CAD). Females, geriatric patients, diabetes mellitus, thyroid disease, malnutrition, alcoholism, or hepatic disease may also be at increased risk for QT prolongation. Assess ECG before starting therapy; do not start product if QTcF >450 msec. Repeat ECG at day 14 of the first cycle, at the beginning of the second cycle, and then as needed; prolongation of the QTcF interval may require interruption of therapy, dose reduction, or discontinuation of therapy. Monitor serum electrolytes (potassium, calcium, phosphorous and magnesium) baseline, at the beginning of the first 6 cycles, and as needed; correct electrolyte imbalances before starting product
• **Pregnancy/breastfeeding:** Avoid by females of reproductive potential during treatment and for at least 3 wk after the last dose, can cause fetal harm or death when used during pregnancy; discontinue breastfeeding during treatment and for 3 wk after the final dose. It is not known whether present in breast milk. Obtain a pregnancy test before starting treatment

### Patient/family education

• **Pregnancy/breastfeeding:** Not to be used in pregnancy, breastfeeding, contraception should be used during and for at 3 wk after last dose
• **Hepatotoxicity:** Patient should report immediately yellowing of skin or eyes, dark urine
• **QT Prolongation:** Teach patient the signs and symptoms of QT prolongation (irregular or rapid heartbeat, fainting). Advise to contact their health care provider immediately if any of these occur
• **Neutropenia:** Teach patient to immediately contact their health care provider if a fever occurs, usually may occur with an infection
• **Drug Interactions:** Teach patient to avoid pomegranate/pomegranate juice, and grapefruit/ grapefruit juice; to avoid strong CYP3A inhibitors, strong CYP3A inducers, and drugs known to prolong the QT interval; all OTC/RX and herbals, supplements should be approved by provider

### Evaluation

**Positive therapeutic outcome**
• Decrease in size of cancerous tumor

## safinamide

(sa-fin'-a-mide)
**Xadago**
*Func. class.:* Antiparkinson's agent
*Chem. class.:* MAO type B inhibitor

**ACTION:** The precise mechanism of action of safinamide in treating "off" episodes in Parkinson's disease is unknown; however, one mechanism may be related to its MAO-B inhibitory activity, which causes an increase in

dopamine levels centrally. The elevated dopamine levels and subsequent increased dopaminergic activity are likely to mediate the beneficial effects of safinamide

**USES:** For adjunctive treatment to levodopa-carbidopa therapy in patients with Parkinson's disease experiencing "off" episodes

## CONTRAINDICATIONS

Hypersensitivity, MAOI therapy

**Precautions:** Abrupt discontinuation, alcoholism, breastfeeding, pregnancy, cataracts, use with CNS depressants, dental work, diabetic retinopathy, hypertension, hepatic disease, impulse control problems, psychosis, schizophrenia, surgery, uveitis

## DOSAGE AND ROUTES

### For adjunctive treatment to levodopa-carbidopa therapy in patients with Parkinson's disease experiencing "off" episodes

**Adult: PO** 50 mg per day, initially. May increase after 2 wk to 100 mg qday, based on need and tolerability. Max: 100 mg/day.

**Available forms:** Tablet 50, 100 mg

### Implementation

- Give at the same time each day; may be given with or without food
- If a dose is missed, take the next dose at the usual time on the next day
- Food and drug interactions with safinamide can be serious. Patients should avoid foods/beverages containing large amounts of tyramine

## ADVERSE EFFECTS

**CNS:** Drowsiness, dyskinesia, insomnia, impulse control symptoms, neuroleptic malignant syndrome, psychosis, serotonin syndrome

**CV:** Orthostatic hypotension

**MISC:** Cough, dyspepsia, cataracts

### Pharmacokinetics

| | |
|---|---|
| **Absorption** | Unknown |
| **Distribution** | Not highly protein bound |
| **Metabolism** | Inhibits intestinal breast cancer resistance protein (BCRP) |
| **Excretion** | Excreted via kidneys 5% (unchanged), 76% recovered in the urine |
| **Half-life** | 20-26 hr |

### Pharmacodynamics

| | |
|---|---|
| **Onset** | Unknown |
| **Peak** | 2-3 hr |
| **Duration** | Unknown |

## INTERACTIONS

### Drug classifications

Anxiolytics, sedatives; hypnotics barbiturates: Increased severe somnolence, avoid using together

MAOIs, linezolid: Increased hypertension, hypertensive crisis, do not use within 14 days of these products

Some other opioids; SNRIs; tricyclic antidepressants and other cyclic antidepressants; triazolopyridine antidepressants; cyclobenzaprine; stimulants (methylphenidate, amphetamines): Increased serotonin syndrome, use the lowest dose

Decreased safinamide effects: Atypical antipsychotics

### Individual drugs

ALPRAZolam, clonazePAM, zolpidem, zaleplon: Increased severe somnolence, avoid using together

Meperidine, dextromethorphan: Increased serotonin syndrome, use lowest dose

## NURSING CONSIDERATIONS

### Assessment

- **Parkinson's disease:** Assess for changes before and during treatment; tremors, pin-rolling movement, balance, anxiety, drooling, depression, delusions, hallucinations, insomnia, shuffling gait; decreasing of "off" periods
- **Mental status:** Assess for affect, depression, mood, complete suicide assessment
- **Hypertension:** May cause hypertension, exacerbate preexisting hypertension, or cause hypertensive crisis. Monitor for new-onset hypertension or hypertension that is not adequately controlled after starting product, adjust dose if elevations in B/P are sustained, do not exceed max dose; monitor for hypertension if coadministered with sympathomimetics (prescription or nonprescription nasal, oral, and ophthalmic decongestants, cold preparations)
- **Drug interactions:** Review drug interactions before use. There are many serious reactions
- **Impulse control:** Inquire periodically about new or worsening impulse control symptoms, (gambling, increased sexual urges, binge eating, intense urges to spend money, or other intense urges); if these occur dose reduction or discontinuation may be needed
- **Pregnancy/breastfeeding:** May cause fetal harm, use in pregnancy only if the potential benefit outweighs fetal risk; do not use in breastfeeding, serious adverse reactions may occur
- **Hepatic disease:** Monitor LFTs baseline and periodically in those with hepatic disease

• Neuroleptic malignant syndrome-like symptoms: Assess for elevated temperature, muscular rigidity, altered consciousness, and autonomic instability, may occur with rapid dose reduction
• **Serotonin syndrome**: Assess for nausea, vomiting, sedation, dizziness, diaphoresis (sweating), facial flushing, mental status changes, myoclonus, restlessness, shivering, and hypertension. If serotonin syndrome occurs, any serotonergic agents should be discontinued

### Patient/family education

• **Impulse control:** Teach patient that impulse control symptoms, (gambling, increased sexual urges, binge eating, intense urges to spend money, or other intense urges) may occur, to report to provider
• **Pregnancy/breastfeeding:** Teach patient to report if pregnancy is planned or suspected or if breastfeeding
• Advise patient not to drive or engage in hazardous activities until result of product is known, drowsiness may occur
• Advise patient to change position slowly to prevent orthostatic hypotension
• Teach patient to use product as prescribed, if discontinued abruptly, neuroleptic malignant syndrome-like symptoms may occur, taper gradually
• Advise patient to use physical activity to maintain mobility, lessen spasms

### Evaluation

**Positive therapeutic outcome**
• Decreased "off" periods in Parkinson's disease

**RARELY USED**

## secnidazole

**Solosec**
*Func. class.:* Antiinfective

**USES:** For the treatment of bacterial vaginosis

## DOSAGE AND ROUTES

**Adult: PO** 2 g PO as a single dose

**RARELY USED**

## semaglutide

**Ozempic**
*Func. class.:* Antidiabetic

**USES:** For the treatment of type 2 diabetes

## DOSAGE AND ROUTES

**For the treatment of type 2 diabetes mellitus in combination with diet and exercise**

**Adult: SUBCUT** Initially, 0.25 mg every 7 days (weekly), give at any time of day, with or without meals; after 4 wk increase the dose to 0.5 mg qwk

**⚠ HIGH ALERT**
**RARELY USED**

## sonidegib

**Odomzo**
*Func. class.:* Antineoplastic

**USES:** Locally advanced basal cell carcinoma that has recurred after surgery or radiation therapy or in those who are not candidates for surgery or radiation therapy

## CONTRAINDICATIONS

Hypersensitivity

### Precautions

**BLACK BOX WARNING:** Pregnancy, intrauterine fetal death, contraceptive requirement

## DOSAGE AND ROUTES

**Adult: PO** 200 mg qday until disease progression or unacceptable toxicity; take on an empty stomach ≥ 1 hr before or 2 hr after a meal. Avoid use with strong CYP3A inhibitors or strong and moderate CYP3A inducers

**Available forms: Cap 200 mg**

**⚠ HIGH ALERT**
**RARELY USED**

## tisagenlecleucel

(tid'-suh-jen-lek'-loo-sel)
**Kymriah**
*Func. class.:* Antineoplastic

**USES:** For the treatment of refractory B-cell precursor acute lymphoblastic leukemia

## DOSAGE AND ROUTES

**Adult: ≤ 25 yr, adolescent, child, infant, and neonate: IV** (> 50 kg), infuse a single dose of 0.1 to 2.5 × $10^8$ CAR-positive viable T-cells (non-weight based); (≤ 50 kg) infuse a single dose of 0.2 to 5 × $10^6$ CAR-positive viable T-cells per kg of body weight. Give at 2 to 14 days after the completion of lymphocyte depletion with fludarabine and cyclophosphamide

**RARELY USED**

## valbenazine

(val-ben′-a-zeen)
**Ingrezza**
*Func. class.:* CNS agent; monoamine depletor

**USES:** For the treatment of tardive dyskinesia

## DOSAGE AND ROUTES

Adult: **PO** Initially, 40 mg qday, after 1 wk, increase to 80 mg qday. Continuation of 40 mg qday may be considered for some patients

# Appendix B

## Ophthalmic, Nasal, Topical, and Otic Products

### OPHTHALMIC PRODUCTS

**ANESTHETICS**

**lidocaine (Rx)**
(lye'doe-kane)
**Akten**

**proparacaine (Rx)**
(proe-par'a-kane)
**Alcaine, Diocaine, Parcaine**

**tetracaine (Rx)**
(tet'ra-kane)
**Minims Tetracaine, Tetracaine, TetraVisc**

**ANTIHISTAMINES**

**alcaftadine**
(al-caf'tah-deen)
**Lastacaft**

**azelastine (Rx)**
(ay-zell'ah-steen)

**cetirizine (Rx)**
(se-teer'-i-zeen)
**Zerviate**

**emedastine (Rx)**
(ee-med'a-steen)
**Emadine**

**epinastine (Rx)**
(ep-een-as'teen)
**Elestat**

**ketotifen (Rx, OTC)**
(kee-toh-tif'en)
**Alaway, Claritin Eye, Zaditor, ZyrTEC Itchy Eye**

**levocabastine (Rx)**
(lee-voh-cab'ah-steen)
**Livostin**

**olopatadine (Rx)**
(oh-loh-pat'ah-deen)
**Pataday, Patanase, Pazeo**

**ANTIINFECTIVES**

**azithromycin (Rx)**
(ay-zi-thro-my'sin)
**AzaSite**

**besifloxacin (Rx)**
(be'si-flox'a-sin)
**Besivance**

**ciprofloxacin (Rx)**
(sip-ro-floks'a-sin)
**Ciloxan**

**erythromycin (Rx)**
(er-ith-roe-mye'sin)
**Ilotycin, Romycin**

**ganciclovir (Rx)**
(gan-sye'kloe-vir)
**Zirgan**

**gatifloxacin (Rx)**
(gat-ih-floks'ah-sin)
**Zymaxid**

**gentamicin (Rx)**
(jen-ta-mye'sin)
**Garamycin Ophthalmic, Gentak, Gentasol**

**levofloxacin (Rx)**
(lee-voh-flock'sah-sin)

**moxifloxacin (Rx)**
(mox-i-flox'a-sin)
**Moxeza, Vigamox**

**natamycin (Rx)**
(nat-a-mye'sin)
**Natacyn**

**ofloxacin (Rx)**
(oh-floks'a-sin)
**Ocuflox**

**silver nitrate 1% (Rx)**
**silver nitrate**

**sulfacetamide sodium (Rx)**
(sul-fa-seet'a-mide)
**Bleph-10**

**tobramycin (Rx)**
(toe-bra-mye'sin)
**Tobrasol, Tobrex**

**trifluridine (Rx)**
(trye-floor'i-deen)
**Viroptic**

**β-ADRENERGIC BLOCKERS**

**betaxolol (Rx)**
(beh-tax'oh-lole)
**Betoptic**

**carteolol (Rx)**
(kar-tee'oh-lole)

**levobetaxolol (Rx)**
(lee-voh-beh-tax'oh-lohl)
**Betaxon**

**levobunolol (Rx)**
(lee-voe-byoo'no-lole)
**Betagen**

**metipranolol (Rx)**
(met-ee-pran'oh-lole)
**OptiPranolol**

**timolol (Rx)**
(tym'moe-lole)
**Betimol**

**CARBONIC ANHYDRASE INHIBITORS**

**brinzolamide (Rx)**
(brin-zoh'la-mide)
**Azopt**

**dorzolamide (Rx)**
(dor-zol'a-mide)
**Trusopt**

**CHOLINERGICS**

**(Direct-acting) acetylcholine (Rx)**
(ah-see-til-koe'leen)
**Miochol-E**

**carbachol (Rx)**
(kar'ba-kole)
**Isopto Carbachol**

**pilocarpine (Rx)**
(pye-loe-kar'peen)
**Isopto Carpine**

**CHOLINESTERASE INHIBITORS**

**physostigmine (Rx)**
(fi-zoe-stig'meen)

**CORTICOSTEROIDS**

**dexamethasone (Rx)**
(dex-a-meth'a-sone)
**Maxidex**

**fluorometholone (Rx)**
(flure-oh-meth'oh-lone)
**Flarex, FML, FML Forte, FML S.O.P.**

**loteprednol (Rx)**
(loe-tee-pred-nole)
**Alrex, Lotemax**

**prednisoLONE (Rx)**
(pred-niss'oh-lone)
**Econopred Plus, Omnipred, Pred-Forte, Pred Mild**

**rimexolone (Rx)**
(ri-mex'a-lone)
**Vexol**

**MYDRIATICS**

**atropine (Rx)**
(a'troe-peen)

**cyclopentolate (Rx)**
(sye-kloe-pen'toe-late)
**Cyclogyl, Cylate**

**homatropine (Rx)**
(home-a'troe-peen)
**Isopto Homatropine**

**phenylephrine (OTC)**
(fen-ill-ef'rin)
**Neofrin**

**NONSTEROIDAL ANTIINFLAMMATORIES**

**bromfenac (Rx)**
(brome'fen-ak)
**Prolensa**

**diclofenac (Rx)**
(dye-kloe'fen-ak)

**flurbiprofen (Rx)**
(flure-bi'pro-fen)
**Ocufen**

**ketorolac (Rx)**
(kee-toe'role-ak)
**Acular, Acuvail**

**nepafenac (Rx)**
(ne-pa-fen'ak)
**Ilevro, Nevanac**

**SYMPATHOMIMETICS**

**apraclonidine (Rx)**
(a-pra-klon'i-deen)
**Iopidine**

**brimonidine (Rx)**
(brem-on'i-dine)
**Alphagan P**

**latanoprostene bunod (Rx)**
(la-tan-oh-pros′-teen bu′-nod)
**Vyzulta**

**OPHTHALMIC DECONGESTANTS/ VASOCONSTRICTORS**

**lodoxamide**
(loe-dox′ah-mide)
**Alomide**

**naphazoline (Rx, OTC)**
(naf-az′oh-leen)
**AK-Con, All Clear AR Maximum Strength Ophthalmic Solution, All Clear Eye Drops, CVS Maximum Redness Relief Eye Drops, CVS Redness Relief Lubricant Eye Drops**

**oxymetazoline (Rx)**
(ox-i-met-ah-zoh′leen)
**Visine L.R.**

**tetrahydrozoline (OTC)**
(tet-ra-hye-dro′zoe-leen)
**Visine Original**

**MISCELLANEOUS OPHTHALMICS**

**bimatoprost (Rx)**
(bih-mat′o-prost)
**Latisse, Lumigan**

**latanoprost (Rx)**
(la-tan′oh-prost)
**Xalatan**

**travoprost (Rx)**
(tra′voe-prost)
**Travatan**

**unoprostone (Rx)**
(yoo-noe-pros′tone)
**Rescula**

## β-ADRENERGIC BLOCKERS

**ACTION:** Reduces production of aqueous humor by unknown mechanism

**USES:** Ocular hypertension, chronic open angle glaucoma

## ANESTHETICS

**ACTION:** Decreases ion permeability by stabilizing neuronal membrane

**USES:** Cataract extraction, tonometry, gonioscopy, removal of foreign objects, corneal suture removal, glaucoma surgery (ophthalmic); pruritus, sunburn, toothache, sore throat, cold sores, oral pain, rectal pain and irritation, control of gagging (topical)

## ANTIINFECTIVES

**ACTION:** Inhibits folic acid synthesis by preventing PABA use, which is necessary for bacterial growth

**USES:** Conjunctivitis, superficial eye infections, corneal ulcers, prophylaxis against infection after removal of foreign matter from the eye

## ANTIINFLAMMATORIES

**ACTION:** Decreases inflammation, resulting in decreased pain, photophobia, hyperemia, cellular infiltration

**USES:** Inflammation of eye, eyelids, conjunctiva, cornea; uveitis, iridocyclitis, allergic conditions, burns, foreign bodies, postoperatively in cataract

## CARBONIC ANHYDRASE INHIBITOR

**ACTION:** Converted to EPINEPHrine, which decreases aqueous production and increases outflow

**USES:** Open angle glaucoma, ocular hypertension

## DIRECT-ACTING MIOTIC

**ACTION:** Acts directly on cholinergic receptor sites; induces miosis, spasm of accommodation, fall in intraocular pressure, caused by stimulation of ciliary, pupillary sphincter muscles, which leads to pulling away of iris from filtration angle, resulting in increased outflow of aqueous humor

**USES:** Primary glaucoma, early stages of wide angle glaucoma (less useful in advanced stages), chronic open angle glaucoma, acute closed angle glaucoma before emergency surgery; also neutralizes mydriatics used during eye exam; may be used alternately with mydriatics to break adhesions between iris and lens

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children, aphakia, hypersensitivity to carbonic anhydrase inhibitors, sulfonamides, thiazide diuretics, ocular inhibitors, renal/hepatic insufficiency

### Implementation

- Storage at room temperature away from light

## ADVERSE EFFECTS
**CNS:** Headache
**CV:** Hypertension, tachycardia, dysrhythmias
**EENT:** Burning, stinging
**GI:** Bitter taste

## NURSING CONSIDERATIONS
### Assessment
- Monitor ophthalmic exams and intraocular pressure readings
- Monitor blood counts; renal/hepatic function tests and serum electrolytes during long-term treatment

### Patient/family education
- Teach how to instill drops
- Advise patient that product may cause burning, itching, blurring, dryness of eye area

### Evaluation
**Positive therapeutic outcome**
- Absence of increased intraocular pressure

## *NASAL AGENTS*

**NASAL ANTIHISTAMINES**

**olopatadine (Rx)**
(oh-low-pat′uh-deen)
**Patanase**

**NASAL DECONGESTANTS**

**azelastine (Rx)**
(ay-zell′ah-steen)
**Astepro**

**EPINEPHrine (OTC)**
(ep-i-neff′rin)
**Adrenalin Nasal Solution**

**oxymetazoline (OTC)**
(ox-i-met-az′oh-leen)
**Afrin No Drip, Dristan 12-HR Nasal Spray, Mucinex Moisture, Mucinex Sinus-Max, Vicks Sinex, Vicks QlearQuil**

**phenylephrine (OTC)**
(fen-ill-eff′rin)
**4-Way Nasal Spray, Neo-Synephrine**

**tetrahydrozoline (OTC)**
(tet-ra-hye-dro′zoe-leen)
**Tyzine, Tyzine Pediatric**

**NASAL STEROIDS**

**beclomethasone (Rx)**
(be-kloe-meth′a-sone)
**Beconase AQ Nasal, Qnasl**

**budesonide (Rx)**
(byoo-des′oh-nide)
**Rhinocort Aqua**

**flunisolide (Rx)**
(floo-niss′oh-lide)

**fluticasone (Rx)**
(floo-tic′a-son)
**Veramyst**

**triamcinolone (Rx)**
(trye-am-sin′oh-lone)
**Allergy 24 HR Nasal Spray, Nasacort**

**NONSTEROIDAL ANTIINFLAMMATORY**

**ketorolac (Rx)**
(kee′toe-role-ak)
**Sprix**

**ACTION:** Produces vasoconstriction (rapid, long acting) of arterioles, thereby decreasing fluid exudation, mucosal engorgement by stimulation of α-adrenergic receptors in vascular smooth muscle

**Therapeutic outcome:** Absence of nasal congestion

**USES:** Nasal congestion

## CONTRAINDICATIONS
Hypersensitivity to sympathomimetic amines

**Precautions:** Pregnancy, children <6 yr, geriatric, diabetes, CV disease, hypertension, hyperthyroidism, increased ICP, prostatic hypertrophy, glaucoma

## DOSAGE AND ROUTES
### Implementation
- Have patient tilt head back, squeeze bulb to create a vacuum, and draw correct amount of sol into dropper; insert 2 gtt of sol into nostril; repeat in other nostril
- Store in light-resistant container; do not expose to high temperature or let sol come into contact with aluminum
- Give for <4 consecutive days
- Provide environmental humidification to decrease nasal congestion, dryness

## ADVERSE EFFECTS
**CNS:** Anxiety, restlessness, tremors, weakness, insomnia, dizziness, fever, headache
**EENT:** Irritation, burning, sneezing, stinging, dryness, rebound congestion
**GI:** Nausea, vomiting, anorexia
**INTEG:** Contact dermatitis

## NURSING CONSIDERATIONS
### Assessment
- Assess for redness, swelling, pain in nasal passages before, during treatment

• Assess for systemic absorption; hypertension, tachycardia; notify prescriber; systemic absorption occurs at high doses or after prolonged use

### Patient/family education

• Advise patient that stinging may occur for several applications; drying of mucosa may be decreased by environmental humidification
• Caution patient to notify prescriber if irregular pulse, insomnia, dizziness, or tremors occur
• Teach patient proper administration to avoid systemic absorption
• Advise patient to rinse dropper with very hot water to prevent contamination

### Evaluation

**Positive therapeutic outcome**
• Decreased nasal congestion

## TOPICAL GLUCOCORTICOIDS

**betamethasone (Rx)**
(bay-ta-meth'a-sone)
**Beben, Betacort, Betanate, Betnovate, Celestoderm, Del-Beta, Ectosone, Metaderm**

**betamethasone (augmented) (Rx)**
(bay-ta-meth'a-sone)
**Diprolene AF**

**clobetasol (Rx)**
(kloe-bay'ta-sol)
**Clobex, Cormax, Dermovate, Olux Topical Foam, Temovate**

**desonide (Rx)**
(dess'oh-nide)
**Desonate, DesOwen, LoKara, Verdeso Foam**

**desoximetasone (Rx)**
(dess-ox-i-met'a-sone)
**Topicort**

**fluocinolone (Rx)**
(floo-oh-sin'oh-lone)
**Derma-Smoothe/FS oil, Lidemol, Lyderm, Synalar, Topsyn**

**flurandrenolide (Rx)**
(flure-an-dren'oh-lide)
**Cordran, Drenison 1/4, Drenison Tape**

**fluticasone (Rx)**
(floo-tik'a-sone)
**Cutivate**

**halcinonide (Rx)**
(hal-sin'oh-nide)
**Halog**

**hydrocortisone (Rx)**
(hye-droe-kor'ti-sone)
**Barriere-HC, CaldeCORT Cortacet, Cortalo, Cortate, Cortef, Corticreme, Cortifoam, Cortoderm, Hyderm, Instacort, Neosporin Eczema Anti-Itch, Novo Hydrocort, Nutracort , Nuzon, Sarna HC, Unicort**

**triamcinolone (Rx)**
(trye-am-sin'oh-lone)
**Dermasorb TA, Kenalog, Pediaderm TA, Trianide, Triderm**

**ACTION:** Antipruritic, antiinflammatory

**Therapeutic outcome:** Decreased itching, inflammation

**USES:** Psoriasis, eczema, contact dermatitis, pruritus; usually reserved for severe dermatoses that have not responded to less potent formulation

### CONTRAINDICATIONS

Hypersensitivity, viral infections, fungal infections

**Precautions:** Pregnancy

### DOSAGE AND ROUTES

**Adult and child:** Apply to affected area

#### Implementation

• Apply only to affected areas; do not get in eyes
• Apply and leave site uncovered or lightly covered; occlusive dressing is not recommended—systemic absorption may occur
• Use only on dermatoses; do not use on weeping, denuded, or infected area
• Cleanse area before application of product
• Continue treatment for a few days after area has cleared
• Store at room temperature

### ADVERSE EFFECTS

**INTEG:** *Acne, atrophy, epidermal thinning, purpura, striae*

### NURSING CONSIDERATIONS

#### Assessment

• Monitor temp; if fever develops, product should be discontinued
• Monitor for systemic absorption, increased temp, inflammation, irritation

### Patient/family education
- Teach patient to avoid sunlight on affected area; burns may occur
- Teach patient to limit treatment to 14 days

### Evaluation
**Positive therapeutic outcome**
- Absence of severe itching, patches on skin, flaking

## TOPICAL ANTIFUNGALS

**clotrimazole (OTC)**
(kloe-trye′ma-zole)
**Canesten, Clotrimaderm, Cruex, Crux, Desenex, Lotrimin AF, Myclo, Neo-Zol**

**econazole (OTC)**
(ee-kon′a-zole)
**Ecoza**

**efinaconazole**
(ef′in-a-kon′a-zole)
**Jublia**

**ketoconazole (OTC)**
(kee-toe-kon′a-zole)
**Extina, Ketodan, Kuric, Xolegel**

**luliconazole**
(loo′li-kon′a-zole)
**Luzu**

**miconazole (OTC)**
(mye-kon′a-zole)
**Antifungal, Azolen, Baza, Cruex, Lotrimin AF, Micaderm, Novana, Triple Paste AF, Zeasorb-AF**

**nystatin (OTC)**
(nye-stat′in)
**Nodostine, Nyamyc, Nyaderm, Nystop, Pediaderm AF**

**selenium (OTC)**
(see-leen′ee-um)

**tavaborole**
(ta′va-bor′ole)
**Kerydin**

**terbinafine (OTC)**
(ter-bin′a-feen)
**LamISIL**

**tolnaftate (OTC)**
(tole-naf′tate)
**Absorbine Athlete's Foot Cream, Lamasil AF Topical Spray, Ting**

**undecylenic acid (OTC)**
(un-deh-sih-len′ik)

**ACTION:** Interferes with fungal cell membrane permeability

**Therapeutic outcome:** Absence of itching and white patches of the skin

**USES:** Tinea cruris, tinea pedis, diaper rash, minor skin irritations; amphotericin B is used for *Candida* infections

## CONTRAINDICATIONS
Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children

## DOSAGE AND ROUTES
Massage into affected area, surrounding area daily or bid, continue for 7-14 days, max 4 wk

### Implementation
- Apply to affected area, surrounding area; do not cover with occlusive dressings
- Store below 30° C (86° F)

## ADVERSE EFFECTS
**INTEG:** Burning, stinging, dryness, itching, local irritation

## NURSING CONSIDERATIONS
### Assessment
- Assess skin for fungal infections: peeling, dryness, itching before, throughout treatment
- Assess for continuing infection; increased size, number of lesions

### Patient/family education
- Instruct to apply with glove to prevent further infection; not to cover with occlusive dressings
- Teach patient that long-term therapy may be needed to clear infection (2 wk-6 mo depending on organism); compliance is needed even after feeling better
- Teach patient proper hygiene: hand-washing technique, nail care, use of concomitant top agents if prescribed
- Caution patient to avoid use of OTC creams, ointments, lotions unless directed by prescriber
- Instruct patient to use medical asepsis (hand washing) before, after each application; to change socks and shoes once a day during treatment of tinea pedis
- Advise patient to report to health care prescriber if infection persists or recurs; if blisters, burning, oozing, swelling occur
- Caution patient to avoid alcohol because nausea, vomiting, hypertension may occur
- Caution patient to use sunscreen or avoid direct sunlight to prevent photosensitivity
- Advise patient to notify prescriber of sore throat, fever, skin rash, which may indicate overgrowth of organisms

### Evaluation

**Positive therapeutic outcome**
- Decrease in size, number of lesions

## TOPICAL ANTIINFECTIVES

**azelaic acid (Rx)**
(a-zuh-lay'ic)
**Azelex, Finacea**
**bacitracin (OTC)**
(bass-i-tray'sin)
**Bacitin**
**clindamycin (Rx)**
(klin-da-my'sin)
**Cleocin T, Clindacin ETZ, Clindacin PAC, Evocin**
**erythromycin (Rx, OTC)**
(er-ith-roe-mye'sin)
**Emgel, Emcin Clear, Ery, Erygel**
**gentamicin (Rx)**
(jen-ta-mye'sin)
**mafenide (Rx)**
(ma'fe-nide)
**Sulfamylon**
**metroNIDAZOLE (Rx)**
(met-roh-nye'da-zole)
**MetroGel, MetroCream, Noritate, Rosadan**
**mupirocin (Rx)**
(myoo-peer'oh-sin)
**Bactroban, Centany**
**retapamulin (Rx)**
(re-tap'a-mue'lin)
**Altabax**
**salicylic acid (Rx)**
(sal'i-sil'ik)
**Bensal HP, Demarest, Keralyt, Salacyn, Salvax, UltraSal-ER**
**silver sulfADIAZINE (Rx)**
(sul-fa-dye'a-zeen)
**Flamazine, Silvadene, SSD, Thermazene**
**tretinoin (Rx)**
(treh'tih-noyn)
**Atralin, Avita, Refissa, Retin-A, Rrnova, Tretin-X**

**ACTION:** Interferes with bacterial protein synthesis

**Therapeutic outcome:** Resolution of infection

**USES:** Skin infections, minor burns, wounds, skin grafts, primary pyodermas, otitis externa

### CONTRAINDICATIONS
Hypersensitivity, large areas, burns, ulcerations

**Precautions:** Pregnancy, breastfeeding, impaired renal function, external ear or perforated eardrum

### Implementation
- Apply enough medication to cover lesions completely
- Apply after cleansing with soap, water before each application; dry well
- Apply to less than 20% of body surface area when patient has impaired renal function
- Store at room temperature in dry place

### ADVERSE EFFECTS
**INTEG:** Rash, urticaria, scaling, redness

### NURSING CONSIDERATIONS
#### Assessment
- Assess for allergic reaction: burning, stinging, swelling, redness
- Assess for signs of nephrotoxicity or ototoxicity

### Evaluation

**Positive therapeutic outcome**
- Decrease in size, number of lesions

## TOPICAL ANTIVIRALS

**acyclovir (Rx)**
(ay-sye'kloe-ver)
**Zovirax Topical**
**penciclovir (Rx)**
(pen-sye'kloe-ver)
**Denavir**

**ACTION:** Interferes with viral DNA replication

**Therapeutic outcome:** Resolution of infection

**USES:** Simple mucocutaneous herpes simplex, in immunocompromised clients with initial herpes genitalis

### CONTRAINDICATIONS
Hypersensitivity

**Precautions:** Pregnancy, breastfeeding

### Implementation
- Apply with finger cot or rubber glove to prevent further infection
- Apply enough medication to cover lesions completely

• Apply after cleansing with soap, water before each application; dry well
• Store at room temperature in dry place

## ADVERSE EFFECTS

**INTEG:** Rash, urticaria, stinging, burning, pruritus, vulvitis

## NURSING CONSIDERATIONS

### Assessment

• Assess for allergic reaction: burning, stinging, swelling, redness, rash, vulvitis, pruritus
• Assess for signs of nephrotoxicity or ototoxicity

### Patient/family education

• Teach patient not to use in eyes or when there is no evidence of infection
• Advise patient to apply with glove to prevent further infection
• Advise patient to avoid use of OTC creams, ointments, lotions unless directed by prescriber
• Advise patient to use medical asepsis (hand washing) before, after each application and avoid contact with eyes
• Advise patient to adhere strictly to prescribed regimen to maximize successful treatment outcome
• Advise patient to begin using product when symptoms arise

### Evaluation

**Positive therapeutic outcome**
• Decrease in size, number of lesions

## TOPICAL ANESTHETICS

**benzocaine (OTC)**
(ben′zoe-kane)
**Americaine Anesthetic, Anbesol Maximum Strength, Boil-Ease, Orajel**

**dibucaine (OTC)**
(dye′byoo-kane)
**Nupercainal**

**lidocaine (Rx, OTC)**
(lye′doe-kane)
**EnovaRx, Glydo, Lidomar, LidoRx, LTA, Solarcaine, Zilactin-L**

**pramoxine (OTC)**
(pra-mox′een)
**Prax, Proctofoam**

**tetracaine (OTC, Rx)**
(tet′ra-cane)
**Pontocaine, Viractin**

**ACTION:** Inhibits conduction of nerve impulses from sensory nerves

**Therapeutic outcome:** Decreasing inflammation, itching, pain

**USES:** Oral irritation, sore throat, toothache, cold sore, canker sore, sunburn, minor cuts, insect bites, pain, itching

## CONTRAINDICATIONS

Hypersensitivity, infants <1 yr, application to large areas

**Precautions:** Pregnancy, children <6 yr, sepsis, denuded skin

## DOSAGE AND ROUTES

**Adult and child:** TOP apply qid as needed; RECT insert tid and after each BM

### Implementation

• Store in tight, light-resistant container; do not freeze, puncture, or incinerate aerosol container

## ADVERSE EFFECTS

**INTEG:** Rash, irritation, sensitization

## NURSING CONSIDERATIONS

### Assessment

• Assess pain: location, duration, characteristics before, after administration
• Assess for infection: redness, drainage, inflammation; this product should not be used until infection is treated

### Patient/family education

• Teach patient to avoid contact with eyes
• Teach patient not to use for prolonged periods: use for <1 wk; if condition remains, prescriber should be contacted

### Evaluation

**Positive therapeutic outcome**
• Decreased redness, swelling, pain

## TOPICAL MISCELLANEOUS

**docosanol (OTC)**
(doh-koh′sah-nohl)
**Abreva**

**pimecrolimus (Rx)**
(pim-eh-kroh-ly′mus)
**Elidel**

**oxymetazoline hydrochloride (Rx)**
(ox-EE-meh-taz-oh-lin)
**Rhofade**

**ACTION:** Docosanol unknown; pimecrolimus may bind with macrophilin and inhibit calcium-dependent phosphatase

**Therapeutic outcome:** Decreased redness, swelling, pain

**USES:** Docosanol applied to fever blisters to promote more rapid healing; pimecrolimus used to treat mild to moderate atopic dermatitis in nonimmunocompromised patients ≥2 yr who are unresponsive to other treatment

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, dermal infections

## DOSAGE AND ROUTES

### Docosanol

**Adult:** TOP rub into blisters 5 ×/day until healing occurs

### Pimecrolimus

**Adult and child ≥2 yr:** TOP apply thin layer 2 ×/day and rub in; use as long as needed

### Implementation

- Apply to skin, rub in gently

## ADVERSE EFFECTS

### Docosanol

NONE known

### Pimecrolimus

**INTEG:** Burning

## NURSING CONSIDERATIONS

### Assessment

- Assess skin condition (color, pain, inflammation) before, after administration
- Assess for signs and symptoms of skin infections (redness, draining lesions); if present, avoid use of product (pimecrolimus)

### Patient/family education

- Advise patient to avoid contact between medication and eyes
- Instruct patient to discontinue use of product when condition clears

### Evaluation

**Positive therapeutic outcome**

- Decreased inflammation, redness

# VAGINAL ANTIFUNGALS

**butoconazole (OTC)**
(byoo-toh-kone′ah-zole)
**Gynazol-1**
**clotrimazole (OTC)**
(kloe-trye′ma-zole)
**Canesten, Gyne-Lotrimin 3, Gyne-Lotrimin 7, Myclo**
**miconazole (OTC)**
(mye-kon′a-zole)
**Monistat 3, Monistat 7**
**terconazole (OTC)**
(ter-kone′ah-zole)
**Terazol 7, Tetrazol 3, Zazole**
**tioconazole (OTC)**
(tye-oh-kone′ah-zole)
**Gyne-Trosyd, Monistat 1, Vagistat-1**

**ACTION:** Interferes with fungal DNA replication; binds sterols in fungal cell membranes, which increases permeability, leaking of nutrients

**Therapeutic outcome:** Fungistatic/fungicidal against susceptible organisms: *Candida* only

**USES:** Vaginal, vulval, vulvovaginal candidiasis (moniliasis)

## CONTRAINDICATIONS

Hypersensitivity

**Precautions:** Pregnancy, breastfeeding, children <2 yr

### Implementation

**Topical route**

- Administer one full applicator every night high into the vagina
- Store at room temperature in dry place

## ADVERSE EFFECTS

**GU:** Vulvovaginal burning, itching, pelvic cramps
**INTEG:** Rash, urticaria, stinging, burning
**MISC:** *Headache,* body pain

## NURSING CONSIDERATIONS

### Assessment

- Assess for allergic reaction: burning, stinging, itching, discharge, soreness

### Patient/family education

- Instruct patient in asepsis (hand washing) before, after each application
- Teach patient to apply with applicator only; to avoid use of any other vaginal product unless directed by prescriber; sanitary napkin may prevent soiling of undergarments
- Instruct patient to abstain from sexual intercourse until treatment is completed; reinfection and irritation may occur
- Advise patient to notify prescriber if symptoms persist

### Evaluation

**Positive therapeutic outcome**
- Decrease in itching or white discharge (vaginal)

## OTIC ANTIINFECTIVES

### ciprofloxacin (Rx)

(sip′roe-flox′a-sin)
**Cetraxal, Ofloxacin, Otiprio**

**ACTION:** Inhibits protein synthesis in susceptible microorganisms

**USES:** Ear infection (external), short-term use

## CONTRAINDICATIONS

Hypersensitivity, perforated eardrum

**Precautions:** Pregnancy

### Implementation

- After removing impacted cerumen by irrigation
- After cleaning stopper with alcohol
- After restraining child if necessary
- After warming sol to body temp

## ADVERSE EFFECTS

**EENT:** Itching, irritation in ear
**INTEG:** Rash, urticaria

## NURSING CONSIDERATIONS

### Assessment

- Assess for redness, swelling, fever, pain in ear, which indicates superinfection

### Patient/family education

- Teach patient correct method of instillation using aseptic technique, including not touching dropper to ear
- Inform patient that dizziness may occur after instillation

### Evaluation

**Positive therapeutic outcome**
- Decreased ear pain

## Appendix C Vaccines and toxoids

| GENERIC NAME | TRADE NAME | USES | DOSAGE AND ROUTES | CONTRAINDICATIONS |
|---|---|---|---|---|
| anthrax vaccine | BioThrax | Pre-/postexposure prophylaxis | **Preexposure**<br>Adult: SUBCUT 0.5 ml at 0, 2, 4 wk, then 0.5 ml at 6, 12, 18 mo<br>**Postexposure**<br>Adult: SUBCUT 0.5 ml 0, 2, 4 wk, with antibiotics | Hypersensitivity |
| BCG vaccine | TICE BCG | TB exposure | Adult and child >1 mo: 0.2-0.3 ml<br>Child <1 mo: Reduce dose by 50% using 2 ml of sterile water after reconstituting | Hypersensitivity, hypogamma-globulinemia, positive TB test, burns |
| diphtheria and tetanus toxoids, adsorbed | Tenivac | Induces antitoxins to provide immunity to diphtheria and tetanus | Adult and child ≥7 yr: IM (adult strength) 0.5 ml q4-8wk × 2 doses, then 3rd dose 6-12 mo after 2nd dose, booster IM 0.5 ml q10yr<br>Child 1-6 yr: IM (pediatric strength) 0.5 ml q4wk × 2 doses, booster 6-12 mo after 2nd dose<br>Infant 6 wk-1 yr: IM (pediatric strength) 0.5 ml q4wk × 3 doses, booster 6-12 mo after 3rd dose | Hypersensitivity to mercury, thimerosal; immunocompromised patients; radiation; corticosteroids; acute illness |
| diphtheria and tetanus toxoids and whole-cell pertussis vaccine (DPT, DTP) | DTwP, Tr-Immunol | Prevention of diphtheria, tetanus, pertussis | Doses vary<br>Check product information | Hypersensitivity, active infection, poliomyelitis outbreak, immunosuppression, febrile illness |
| diphtheria and tetanus toxoids and acellular pertussis vaccine | Adacel, Boostrix, Daptacel, Infranrix | | | |
| diphtheria, tetanus, pertussis, haemophilus, polio IPV | Pentacel | Immunity to diphtheria, tetanus, pertussis, haemophilus, polio IPV | Infant >6 wk and child ≤5 yr: IM 0.5 ml at 2, 4, 6, and 15-18 mo | Hypersensitivity, polio outbreak, acute infection, immunosuppression |
| diphtheria, tetanus, pertussis, polio vaccine IPV | Kinrix, Quadracel | Immunity to diphtheria, tetanus, pertussis, polio vaccine IPV | Child: IM 0.5 ml | Hypersensitivity, polio outbreak, acute infection, immunosuppression |

*Continued*

## Appendix C Vaccines and toxoids—cont'd

| GENERIC NAME | TRADE NAME | USES | DOSAGE AND ROUTES | CONTRAINDICATIONS |
|---|---|---|---|---|
| H1N1 influenza A (swine flu) virus vaccine | Influenza A (H1N1) | Immunity to H1N1 | Adult <50 yr, adolescent, child ≥2 yr: Intranasal 1 dose (roughly 0.1 ml) into each nostril; child 2-9 repeat dose ≥4 wk later<br>Adult, adolescent, child ≥3 yr: IM 0.5 ml as a single dose; child 3-9 yr repeat dose ≥4 wk later (Sanofi) (CSL); child 4-9 yr repeat dose ≥4 wk later (Novartis); infants ≥6 mo, child <36 mo: IM 0.25 ml, repeat in 4 wk (Sanofi)<br>Adult: IM 0.5 ml as a single dose (GSK) | |
| haemophilus b conjugate vaccine, diphtheria $CRM_{197}$ protein conjugate (HbOC) | HibTITER | Polysaccharide immunization of children 2-6 yr against *H. influenzae* b, conjugate | **HibTITER (IM only)**<br>Child: IM 0.5 ml<br>Child 2-6 mo: 0.5 ml q2mo × 3 inj | Hypersensitivity, febrile illness, active infection |
| haemophilus b conjugate vaccine, meningococcal protein conjugate (PRP-OMP) | PedvaxHIB | Immunization of child 2, 4, 6 mo | Child 7-11 mo: Previously unvaccinated 0.5 ml q2mo inj<br>Child 12-14 mo: Previously unvaccinated 0.5 ml × 1 inj<br>**PedvaxHIB (IM only)**<br>Child 2-14 mo: 0.5 ml × 2 inj at 2, 4 mo of age (6 mo dose not needed), then booster at 12-18 mo against invasive disease<br>Child ≥15 mo: Previously unvaccinated 0.5 ml inj | |
| hepatitis A vaccine, inactivated | Havrix, VAQTA | Active immunization against hepatitis A virus | Adult: IM 1440 EL units (Havrix) or 50 units (VAQTA) as a single dose; booster dose is the same given at 6, 12 mo<br>Child 2-18 yr: IM 720 EL units (Havrix) or 25 units (VAQTA) as a single dose, booster dose is the same given at 6, 12 mo | Hypersensitivity |
| hepatitis B vaccine, recombinant | Engerix-B, Recombivax HB | Immunization against all subtypes of hepatitis B virus | Varies widely | Hypersensitivity to this vaccine or yeast |
| human papillomavirus recombinant vaccine, quadrivalent | Gardasil | Prevention of HPV types 6, 11, 16, 18, cervical cancer, genital warts, precancerous dysplastic lesions, anal cancer/anal intraepithelial neoplasia | Adult up to 26 yr and child >9 yr to 26 yr: IM give as 3 separate doses; 1st dose as elected; 2nd dose 2 mo after 1st dose; 3rd dose 6 mo after 1st dose | Child <9 yr, pregnancy, breastfeeding, geriatric, active disease, hypersensitivity |

| | | | | |
|---|---|---|---|---|
| influenza virus vaccine | Afluria, FluMist, Fluvirin, Fluzone | Prevention of seasonal influenza | Adult and child >12 yr: IM 0.5 ml in 1 dose<br>Adult 18-64 yr: ID 0.1 ml as a single dose<br>Child 3-12 yr: IM 0.5 ml, repeat in 1 mo (split) unless 1978-1985 vaccine was given; also given nasal<br>Child 6 mo to 3 yr: IM 0.25 ml, repeat in 1 mo (split) unless 1978-1985 vaccine was given; also given nasal child ≤2 yr | Hypersensitivity, active infection, chicken egg allergy, Guillain-Barré syndrome, active neurologic disorders |
| Japanese encephalitis virus vaccine, inactivated | Ixiaro | Active immunity against Japanese encephalitis (JE) | Adult/child >3 yr: IM 0.5 ml (deltoid), then 0.5 ml 28 days later. Give the second dose ≥1 wk before potential exposure<br>Child ≥2 mo to <3 yr: IM 0.25 ml (anterolateral aspect of the thigh or deltoid for children 1-2 yr with adequate muscle mass), then 0.25 ml 28 days later | Hypersensitivity to murine, thimerosal; allergic reactions to previous dose |
| measles, mumps, and rubella vaccine, live | M-M-R-II | Prevention of measles, mumps, rubella | Adult: SUBCUT 1 vial; 2 vials separated by 1 mo, in person born after 1957<br>Child >15 mo and adult: SUBCUT 0.5 ml | Hypersensitivity, blood dyscrasias, anemia, active infection, immunosuppression; egg, chicken allergy; pregnancy, febrile illness, neomycin allergy, neoplasms |
| measles, mumps, rubella, varicella | ProQuad | Immunity to measles, mumps, rubella, varicella | Child: SUBCUT 0.5 ml | Hypersensitivity to eggs, neomycin, cancer, radiation, corticosteroids, blood dyscrasias, active untreated TB |
| meningococcal polysaccharide vaccine | Menomune-A/C | Prophylaxis to meningococcal meningitis | Adult and child >2 yr: SUBCUT 0.5 ml | Hypersensitivity to thimerosal, pregnancy, acute illness |
| pneumococcal 7-valent conjugate vaccine | Prevnar | Immunity against *Streptococcus pneumoniae* | Child: IM 0.5 ml ×3 doses (7-11 mo); × 2 doses (12-23 mo); × 1 dose >2-9 yr | Hypersensitivity to diphtheria toxoid or this product |
| pneumococcal vaccine, polyvalent | Pneumovax 23 | Pneumococcal immunization | Adult and child >2 yr: IM/SUBCUT 0.5 ml | Hypersensitivity, Hodgkin's disease, ARDS |
| poliovirus vaccine (IPV) | IPOL | Prevention of polio | Adult and child >2 yr: PO 0.5 ml, given q8wk × 2 doses, then 0.5 ml ½-1 yr after dose 2<br>Infant: PO 0.5 ml at 2, 4, 18 mo; booster at 4-6 yr; may also be given: IPV at 2, 4 mo, then TOPV at 12-18 mo, booster at 4-6 yr | Hypersensitivity, active infection, allergy to neomycin/streptomycin, immunosuppression, vomiting, diarrhea |
| rabies vaccine, human diploid cell (HDCV) | Imovax, RabAvert | Active immunity to rabies | **Preexposure**<br>Adult and child: IM 1 ml day 0, 7, 21, or 28 (total 4 doses)<br>**Postexposure**<br>Adult and child: IM 1 ml on day 0, 3, 7, 14, 28 (total 5 doses) | No contraindications |

*Continued*

## Appendix C Vaccines and toxoids—cont'd

| GENERIC NAME | TRADE NAME | USES | DOSAGE AND ROUTES | CONTRAINDICATIONS |
|---|---|---|---|---|
| rotovirus | RotaTeq, Rotarix | Prevents rotovirus | Infant: PO 3 doses given between 6 and 32 wk of age; 1st dose between 6-12 wk of age; 2nd and 3rd doses q4-10wk | Hypersensitivity to this product or latex, immunocompromised, blood products given within 6 wk, lymphatic disorders |
| tetanus toxoid, adsorbed | No trade name | Tetanus toxoid: Used for prophylactic treatment of wounds | Adult and child: IM 0.5 ml q4-6wk × 2 doses, then 0.5 ml 1 yr after dose 2 (adsorbed); SUBCUT/IM 0.5 ml q4-8wk × 3 doses, then 0.5 ml ½-1 yr after dose 3, booster dose 0.5 ml q10yr | Hypersensitivity, active infection, poliomyelitis outbreak, immunosuppression |
| typhoid vaccine, parenteral<br>typhoid vaccine, oral | Typhim Vi<br>Vivotif Berna Vaccine | Active immunity to typhoid fever | Adult: PO 1 cap 1 hr before meals × 4 doses, booster q5yr<br>Adult and child >10 yr: SUBCUT 0.5 ml, repeat in 4 wk, booster q3yr<br>Child 6 mo-10 yr: SUBCUT 0.25 ml, repeat in 4 wk, booster q3yr | Parenteral: Systemic or allergic reaction, acute respiratory or other acute infection, intensive physical exercise in high temperatures<br>Oral: Hypersensitivity, acute febrile illness, suppressive or antibiotic products |
| typhoid Vi polysaccharide vaccine | Typhim Vi | Active immunity to typhoid fever | Adult and child ≥2 yr: IM 0.5 ml as a single dose, reimmunize q2yr 0.5 ml IM, if needed | Hypersensitivity, chronic typhoid carriers |
| Varicella-Zoster Virus Vaccine | Varivax, Zostavax | Prevention of varicella-zoster (chickenpox) | Adult and child ≥13 yr: SUBCUT 0.5 ml, 2nd dose SUBCUT 0.5 ml 4-8 wk later | Hypersensitivity to neomycin; blood dyscrasias, immunosuppression, active untreated TB, acute illness, pregnancy, diseases of lymphatic system |
| yellow fever vaccine | YF-Vax | Active immunity to yellow fever | Adult and child ≥9 mo: SUBCUT 0.5 ml deeply, booster q10yr<br>Child 6-9 mo: same as above if exposed | Hypersensitivity to egg or chicken embryo protein, pregnancy, child <6 mo, immunodeficiency |
| Zoster vaccine recombinant, adjuvanted | Shingrix | For the prevention of herpes zoster (shingles) | Adult: IM 2 doses (0.5 mL each) at 0 and 2 to 6 months | History of severe allergic reaction (e.g., anaphylaxis) to any component of the vaccine or after a previous dose |

# Appendix D

## Abbreviations

| | |
|---|---|
| **abd** | abdomen |
| **ABG** | arterial blood gas |
| **ac** | before meals |
| **ACE** | angiotensin-converting enzyme |
| **ACT** | activated clotting time |
| **ADA** | American Diabetes Association |
| **ADH** | antidiuretic hormone |
| **ALT** | alanine aminotransferase |
| **ANA** | antinuclear antibody |
| **AP** | anteroposterior |
| **APLA** | antiphospholipid antibody syndrome |
| **APTT** | activated partial thromboplastin time |
| **ASA** | acetylsalicylic acid, aspirin |
| **ASHD** | arteriosclerotic heart disease |
| **AST** | aspartate aminotransferase (SGOT) |
| **AV** | atrioventricular |
| **bid** | twice a day |
| **BM** | bowel movement |
| **BMR** | basal metabolic rate |
| **B/P** | blood pressure |
| **BPH** | benign prostatic hypertrophy |
| **BPM** | beats per minute |
| **BS** | blood sugar |
| **BUN** | blood urea nitrogen |
| **C** | Celsius (centigrade) |
| **CAD** | coronary artery disease |
| **cap** | capsule |
| **Cath** | catheterization or catheterize |
| **CBC** | complete blood cell count |
| **HF** | heart failure |
| **CHo** | carbohydrates |
| **cm** | centimeter |
| **CNS** | central nervous system |
| **$CO_2$** | carbon dioxide |
| **cont** | continuous |
| **COPD** | chronic obstructive pulmonary disease |
| **CPAP** | continuous positive airway pressure |
| **CPK** | creatinine phosphokinase |
| **CPR** | cardiopulmonary resuscitation |
| **CCr** | creatinine clearance |
| **C&S** | culture and sensitivity |
| **C sect** | cesarean section |
| **CSF** | cerebrospinal fluid |
| **CTCL** | cutaneous T-cell lymphoma |
| **CV** | cardiovascular |
| **CVA** | cerebrovascular accident |
| **CVP** | central venous pressure |
| **D&C** | dilatation and curettage |
| **dir inf** | direct infusion |
| **dr** | dram |
| **$D_5W$** | 5% glucose in distilled water |
| **DVT** | deep vein thrombosis |
| **ECG** | electrocardiogram (EKG) |
| **EDTA** | ethylenediamine tetraacetic acid |
| **EEG** | electroencephalogram |
| **EENT** | ear, eye, nose, and throat |
| **EPS** | extrapyramidal symptoms |
| **ESR** | erythrocyte sedimentation rate |
| **ext rel** | extended release |
| **FBS** | fasting blood sugar |
| **FHT** | fetal heart tones |
| **FSH** | follicle-stimulating hormone |
| **g** | gram |
| **GABA** | γ-aminobutyric acid |
| **GI** | gastrointestinal |
| **GPC** | giant papillary conjunctivitis |
| **gr** | grain |
| **GTT** | glucose tolerance test |
| **gtt** | drops |
| **GU** | genitourinary |
| **GVHD** | graft-versus-host disease |
| **$H_2$** | $histamine_2$ |
| **hCG** | human chorionic gonadotropin |
| **Hct** | hematocrit |
| **HDCV** | human diploid cell rabies vaccine |
| **Hgb** | hemoglobin |
| **H&H** | hematocrit and hemoglobin |
| **5-HIAA** | 5-hydroxyindoleacetic acid |
| **HIV** | human immunodeficiency virus (AIDS) |
| **$H_2O$** | water |
| **HOB** | head of bed |
| **HR** | heart rate |
| **hr** | hour |
| **IBD** | inflammatory bowel disease |
| **IC** | intracardiac |
| **ICP** | intracranial pressure |
| **ID** | intradermal |
| **IgG** | immunoglobulin G |
| **IM** | intramuscular |
| **inf** | infusion |
| **INH** | inhalation |
| **inj** | injection |
| **I&O** | intake and output |
| **IPPB** | intermittent positive-pressure breathing |
| **IT** | intrathecal |
| **ITP** | idiopathic thrombocytopenic purpura |
| **IUD** | intrauterine device |
| **IV** | intravenous |
| **IVP** | intravenous pyelogram |
| **K** | potassium |
| **kg** | kilogram |
| **L** | liter |
| **lb** | pound |
| **LDH** | lactic dehydrogenase |
| **LE** | lupus erythematosus |
| **LH** | luteinizing hormone |
| **LLQ** | left lower quadrant |
| **LMP** | last menstrual period |
| **LOC** | level of consciousness |
| **LR** | lactated Ringer's solution |
| **LUQ** | left upper quadrant |
| **M** | meter |
| **m** | minim |
| **$m^2$** | square meter |
| **MAOI** | monoamine oxidase inhibitor |
| **mcg** | microgram |
| **mEq** | milliequivalent |
| **mg** | milligram |
| **MI** | myocardial infarction |
| **min** | minute |
| **ml** | milliliter |
| **mm** | millimeter |
| **mo** | month |
| **Na** | sodium |
| **neg** | negative |
| **NGU** | nongonococcal urethritis |
| **NHL** | non-Hodgkin's lymphoma |
| **NPO** | nothing by mouth (Lat. *nulla per os*) |
| **NS** | normal saline |
| **$O_2$** | oxygen |

| | |
|---|---|
| **OBS** | organic brain syndrome |
| **OD** | right eye |
| **OR** | operating room |
| **OS** | left eye |
| **OTC** | over-the-counter |
| **OU** | each eye |
| **oz** | ounce |
| **p̄** | after |
| **P56** | Plasma-Lyte 56 |
| **$PaCO_2$** | arterial carbon dioxide tension (pressure) |
| **$PaO_2$** | arterial oxygen tension (pressure) |
| **PAT** | paroxysmal atrial tachycardia |
| **PBI** | protein-bound iodine |
| **pc** | after meals |
| **PCI** | percutaneous coronary intervention |
| **PCWP** | pulmonary capillary wedge pressure |
| **PEEP** | positive end-expiratory pressure |
| **PERRLA** | pupils equal, round, react to light and accommodation |
| **pH** | hydrogen ion concentration |
| **PO** | by mouth |
| **postop** | postoperative |
| **PP** | postprandial |
| **PPHN** | persistent pulmonary hypertension of the newborn |
| **preop** | preoperative |
| **prn** | as required |
| **PT** | prothrombin time |
| **PTT** | partial thromboplastin time |
| **PVC** | premature ventricular contraction |
| **q** | every |
| **qAM** | every morning |
| **qhr** | every hour |
| **q2hr** | every 2 hours |
| **q3hr** | every 3 hours |
| **q4hr** | every 4 hours |
| **q6hr** | every 6 hours |
| **q12hr** | every 12 hours |
| **qid** | four times daily |
| **qmo** | every month |
| **qPM** | every night |
| **qs** | sufficient quantity |
| **qt** | quart |
| **qwk** | every week |
| **R** | right |
| **RAIU** | radioactive iodine uptake |
| **RBC** | red blood count or cell |
| **RLQ** | right lower quadrant |
| **ROM** | range of motion |
| **RUQ** | right upper quadrant |
| **Rx** | prescription |
| **SARS** | severe acute respiratory syndrome |
| **SCr** | serum creatinine |
| **SIMV** | synchronous intermittent mandatory ventilation |
| **SL** | sublingual |
| **SLE** | systemic lupus erythematosus |
| **SOB** | shortness of breath |
| **sol** | solution |
| **sp gr** | specific gravity |
| **ss** | one half |
| **STD** | sexually transmitted disease |
| **SUBCUT** | subcutaneous |
| **supp** | suppository |
| **sus rel** | sustained release |
| **syr** | syrup |
| **T&A** | tonsillectomy and adenoidectomy |
| **tab** | tablet |
| **tbsp** | tablespoon |
| **TD** | transdermal |
| **temp** | temperature |
| **tid** | three times daily |
| **tinc** | tincture |
| **TPN** | total parenteral nutrition |
| **TOP** | topical |
| **TSH** | thyroid-stimulating hormone |
| **tsp** | teaspoon |
| **TT** | thrombin time |
| **UA** | urinalysis |
| **UTI** | urinary tract infection |
| **UV** | ultraviolet |
| **vag** | vaginal |
| **VMA** | vanillylmandelic acid |
| **vol** | volume |
| **VS** | vital sign |
| **WBC** | white blood cell count |
| **wk** | week |
| **wt** | weight |
| **yr** | year |
| **>** | greater than |
| **<** | less than |
| **=** | equal |
| **°** | degree |
| **%** | percent |
| **α** | alpha |
| **γ** | gamma |
| **β** | beta |

- For a list of the Institute for Safe Medicine Practices (ISMP) error-prone abbreviations, symbols, and dose designations, please see http://www.ismp.org/tools/errorproneabbreviations.pdf.
- For frequently asked questions regarding the 2018 National Patient Safety Goals, please visit The Joint Commission website at http://www.jointcommission.org/PatientSafety/NationalPatientSafetyGoals.

## Recommended Childhood and Adolescent Immunization Schedule—United States, 2010

## Immunization Schedule for Persons Aged 0-6 Years

| Vaccine ▼ Age ▶ | Birth | 1 month | 2 months | 4 months | 6 months | 12 months | 15 months | 18 months | 19-23 months | 2-3 years | 4-6 years |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hepatitis B* | HepB | HepB | | | HepB | | | | | | |
| Rotavirus* | | | Rota | Rota | Rota | | | | | | |
| Diphtheria, Tetanus, Pertussis* | | | DTaP | DTaP | DTaP | * | DTaP | | | | DTaP |
| *Haemophilus Influenzae* Type b* | | | Hib | Hib | Hib* | Hib | | | | | |
| Pneumococcal* | | | PCV | PCV | PCV | PCV | | | | PPSV | |
| Inactivated Poliovirus | | | IPV | IPV | IPV | | | | | | IPV |
| Influenza* | | | | | Influenza (Yearly) | | | | | | |
| Measles, Mumps, Rubella* | | | | | | MMR | | | | | MMR |
| Varicella* | | | | | | Varicella | | | | | Varicella |
| Hepatitis A* | | | | | | HepA (2 doses) | | | | HepA Series | |
| Meningococcal* | | | | | | | | | | MCV | |

Range of recommended ages

Certain high-risk groups

This schedule indicates the recommended ages for routine administration of currently licensed childhood vaccines, as of December 15, 2009, for children aged 0-6 years. Any dose not administered at the recommended age should be administered at any subsequent visit, when indicated and feasible. Additional vaccines may be licensed and recommended during the year. Licensed combination vaccines may be used whenever any components of the combination are indicated and other components of the vaccine are not contraindicated and if approved by the Food and Drug Administration for that dose of the series. **Providers should consult the respective Advisory Committee on Immunization Practices statement for detailed recommendations, including for high-risk conditions: http://www.cdc.gov/vaccines/pubs/ACIP-list.htm.** Clinically significant adverse events that follow immunization should be reported to the Vaccine Adverse Event Reporting System (VAERS). Guidance about how to obtain and complete a VAERS form is available at **http://www.vaers.hhs.gov** or by telephone, **800-822-7967**.

*For complete information go to **http://www.cdc.gov/vaccines/schedules/index**

# Immunization Schedule for Persons Aged 7-18 Years

| Vaccine ▼ / Age ▶ | 7-10 years | 11-12 years | 13-18 years |
|---|---|---|---|
| Tetanus, Diphtheria, Pertussis* | | Tdap | Tdap |
| Human Papillomavirus* | * | HPV (3 doses) | HPV Series |
| Meningococcal* | MCV | MCV | MCV |
| Influenza* | | Influenza (Yearly) | |
| Pneumococcal* | | PPSV | |
| Hepatitis A* | | HepA Series | |
| Hepatitis B* | | HepB Series | |
| Inactivated Poliovirus* | | IPV Series | |
| Measles, Mumps, Rubella* | | MMR Series | |
| Varicella* | | Varicella Series | |

Range of recommended ages

Catch-up immunization

Certain high-risk groups

This schedule indicates the recommended ages for routine administration of currently licensed childhood vaccines, as of December 15, 2009, for children aged 7-18 years. Any dose not administered at the recommended age should be administered at any subsequent visit, when indicated and feasible. Additional vaccines may be licensed and recommended during the year. Licensed combination vaccines may be used whenever any components of the combination are indicated and other components of the vaccine are not contraindicated and if approved by the Food and Drug Administration for that dose of the series. **Providers should consult the respective Advisory Committee on Immunization Practices statement for detailed recommendations, including for high-risk conditions: http://www.cdc.gov/vaccines/pubs/ACIP-list.htm.** Clinically significant adverse events that follow immunization should be reported to the Vaccine Adverse Event Reporting System (VAERS). Guidance about how to obtain and complete a VAERS form is available at **http://www.vaers.hhs.gov** or by telephone, **800-822-7967**.

*For complete information go to **http://www.cdc.gov/nip/recs/child-schedule.htm#printable.**

# Appendix F

## Standard Precautions

The following precautions are used in the care of all patients regardless of their diagnosis or disease. They are also applied when handling or cleaning equipment or supplies that are potentially contaminated.

1. Wear gloves any time that you may contact blood, any moist body fluid (except sweat), secretions, excretions, nonintact skin, or mucous membranes.
2. Remove your gloves, wash your hands, and reapply clean gloves if your gloves become soiled with infective material.
3. Even if you are wearing gloves, remove them, wash your hands, and apply clean gloves *immediately before* contact with mucous membranes or nonintact skin.
4. Wear a protective cover gown of waterproof material if your clothing is likely to have substantial contact with infective material or if splashing of body fluids is likely.
5. Wear a face shield or goggles to protect your eyes if splashing of secretions is likely.
6. Any time a face shield or goggles are worn, wear a surgical mask to protect the mucous membranes of your nose and mouth. A surgical mask may be worn during certain sterile procedures without protective eyewear. However, protective eyewear is *never* worn without a surgical mask.
7. Handle needles, razors, broken glass, and other sharp objects with care. Needles should never be recapped. All sharps should be disposed of in a puncture-resistant sharps container.
8. Wash your hands before and after each patient contact.
9. Wash your hands before you apply and after you remove gloves. Do not assume that hand washing is unnecessary because gloves were worn. Do not wash your hands with gloves on them.
10. Gloves are used for the care of one patient only, then discarded.
11. Follow your facility policy for disposal of gloves and other contaminated items. These items are generally not disposed of in open trash containers. Facilities have designated disposal sites for these biohazardous waste materials.
12. Use resuscitation barrier devices as an alternative to mouth-to-mouth resuscitation.
13. Linen should be handled in a manner that prevents contamination of the outside of the container. Linen from isolation rooms was previously double bagged. Double bagging is no longer recommended since all linen is handled as potentially infectious. Double bag linen only if the outside of the bag becomes contaminated during the bagging process.

# Appendix G

## Illustrated Mechanisms and Sites of Action

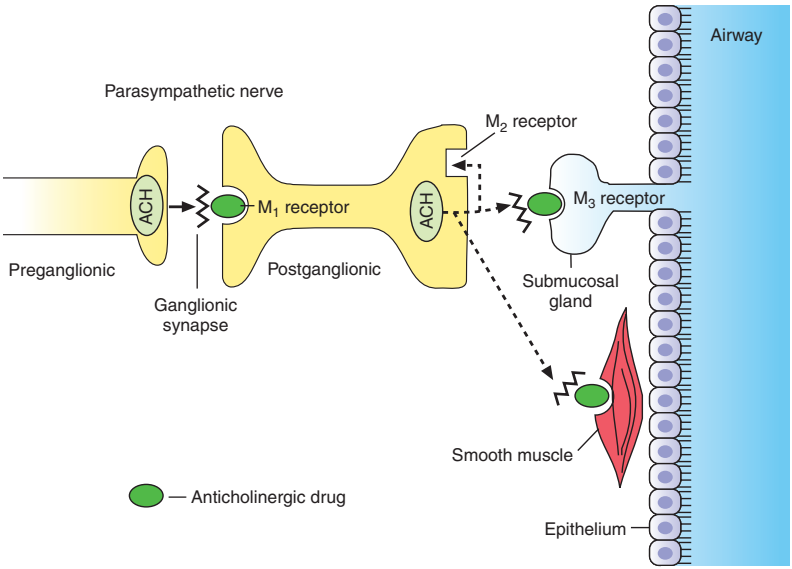



**Fig. G-1 Sites and Mechanisms of Action: Anticholinergic Bronchodilators:** Anticholinergic bronchodilators, such as ipratropium, work by blocking muscarinic-1 ($M_1$) receptors on postganglionic parasympathetic nerve endings and muscarinic-3 ($M_3$) receptors on the cell membranes of bronchial smooth muscles and submucosal glands. Normally, stimulation of the $M_1$ and $M_3$ receptors by acetylcholine (ACH) causes bronchoconstriction and mucus secretion from submucosal glands. Anticholinergic bronchodilators block these specific muscarinic receptors from the effects of acetylcholine, causing bronchial smooth muscle relaxation, bronchodilatation, and decreased mucus production. (From Gardenhire OS: *Rau's Respiratory Care Pharmacology,* ed 8, St. Louis, 2012, Mosby.)

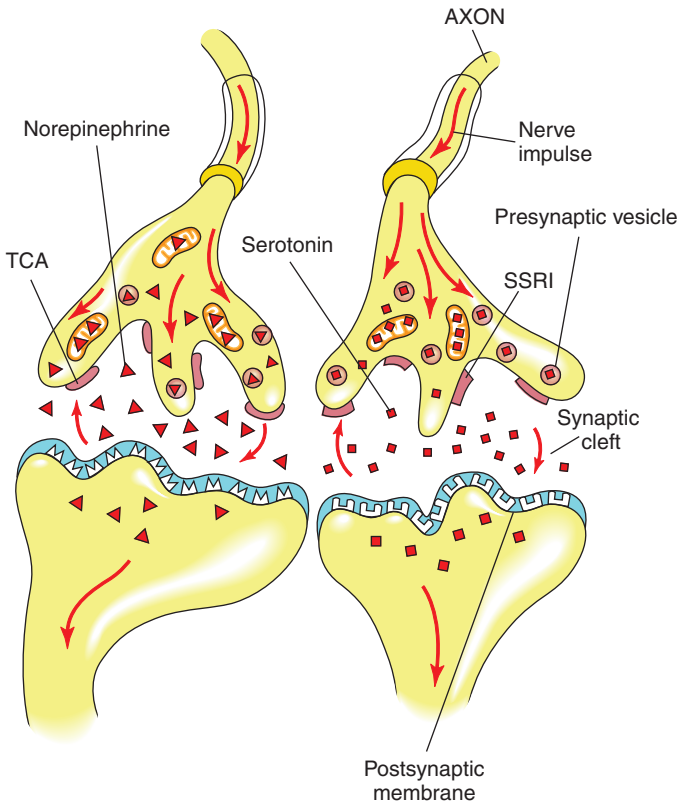



**Fig. G-2 Mechanisms of Action: Antidepressants.** Depression is thought to occur when levels of neurotransmitters, such as norepinephrine and serotonin, are reduced at postsynaptic receptor sites. These neurotransmitters affect a wide array of functions, including mood, obsessions, appetite, and anxiety. Antidepressants work by increasing the availability of these neurotransmitters at postsynaptic membranes and by enhancing and prolonging their effects. As a result, these agents improve mood, reduce anxiety, and minimize obsessions.

Antidepressants typically are classified as tricyclic antidepressants (TCAs), monoamine oxidase inhibitors (not shown), selective serotonin reuptake inhibitors (SSRIs), and atypical antidepressants (not shown). TCAs, such as amitriptyline and desipramine, primarily block norepinephrine reuptake at presynaptic membranes, thereby increasing the norepinephrine concentration at synapses and making more available at postsynaptic receptors.

SSRIs, such as FLUoxetine and PARoxetine, selectively inhibit serotonin uptake at presynaptic membranes. This action leads to increased serotonin availability at postsynaptic receptors. (From Gutierrez K: *Pharmacotherapeutics: Clinical Reasoning in Primary Care,* ed 2, Philadelphia, 2008, Saunders.)

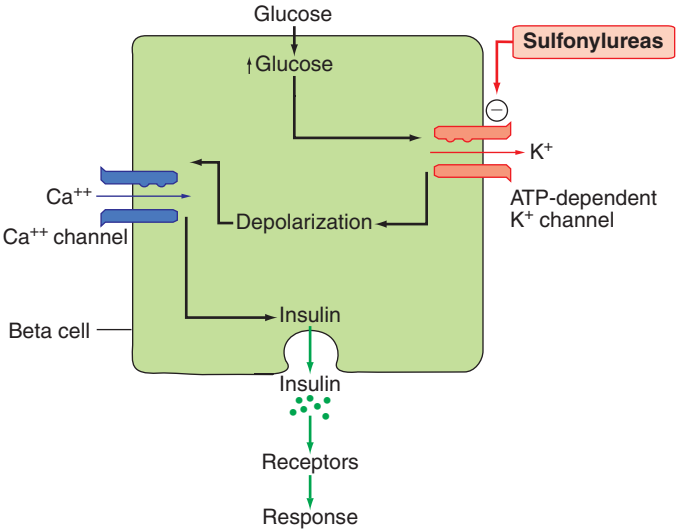



**Fig. G-3 Mechanisms of Action: Antidiabetic Agents.** Diabetes mellitus takes two forms: type 1 diabetes characterized by a complete lack of insulin and type 2 diabetes marked by insufficient insulin secretion, insulin resistance in peripheral tissues, or both. Normally, the beta cells in the pancreatic islets of Langerhans are responsible for secreting insulin. The rise of glucose levels in the beta cell triggers adenosine triphosphate (ATP)-dependent potassium ($K^+$) channels in the membranes of beta cells to close. Then the beta cells depolarize and calcium ($Ca^{++}$) enters the cell through $Ca^{++}$ channel, and insulin is released from the cell. When circulating insulin engages with insulin receptors on cell membranes, it facilitates the movement of glucose into the cell, among other actions.

Type 1 diabetes is treated with the use of exogenous insulin, which mimics natural insulin in the body. Insulin takes many forms with varying degrees of onset, peak, and duration, including rapid, regular, intermediate, and long acting.

Type 2 diabetes is usually treated with oral agents. Sulfonylureas, such as glyBURIDE, block ATP-dependent $K^+$ channels in the cell membranes of beta cells, ultimately resulting in the release of insulin. (From Taylor: *Mosby's Crash Course Pharmacology,* St. Louis, 1998, Mosby.)

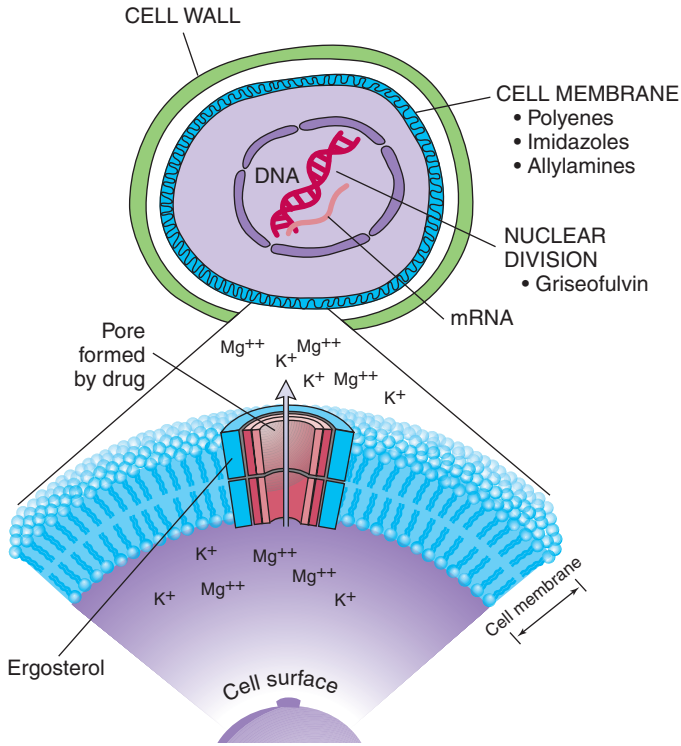



**Fig. G-4 Sites and Mechanisms of Action: Antifungal Agents.** Antifungal agents primarily affect fungi at one of two sites: the cell membrane or the cell nucleus. Most of these agents, such as polyene, imidazole, and allylamine antifungals, act on the fungal cell membrane. Polyene antifungals, such as amphotericin B, bind to ergosterol and increase cell membrane permeability. Imidazole antifungals, such as fluconazole and ketoconazole, interfere with ergosterol synthesis by inhibiting the cytochrome $P_{450}$ enzyme system, altering the cell membrane, and inhibiting fungal growth. Allylamine antifungals, such as terbinafine, inhibit the enzyme squalene epoxidase, which disrupts ergosterol production—and cell membrane integrity. When cell membrane permeability increases, cellular components, including potassium ($K^+$) and magnesium ($Mg^{++}$), leak out. Loss of these cellular components leads to cell death.

Another antifungal agent, griseofulvin, directly affects the fungal nucleus, interfering with mitosis. By binding to structures in the mitotic spindle, it prevents cells from dividing, which eventually leads to their death. (From Gutierrez K: *Pharmacotherapeutics: Clinical Reasoning in Primary Care,* ed 2, Philadelphia, 2008, Saunders.)

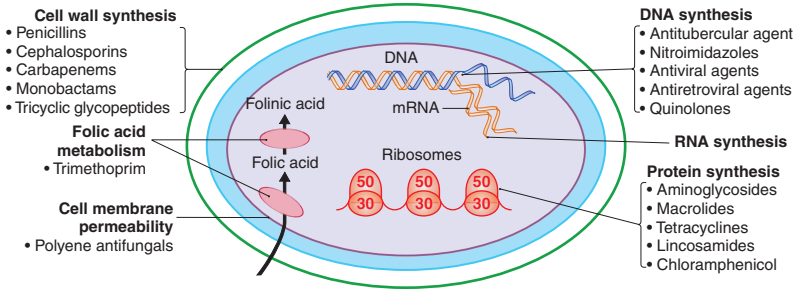



**Fig. G-5 Sites and Mechanisms of Action: Antiinfective Agents.** The goal of antiinfective therapy is to kill or inhibit the growth of microorganisms such as bacteria, viruses, and fungi. To achieve this goal, antiinfective agents must reach their targets, which usually occurs through absorption and distribution by the circulatory system. When the target is reached, a drug can kill or suppress microorganisms by:

- Inhibiting cell wall synthesis or activating enzymes that disrupt the cell wall, which leads to cellular weakening, lysis, and death. Penicillins (ampicillin), cephalosporins (ceFAZolin), carbapenems (imipenem), monobactams (aztreonam), and tricyclic glycopeptides (vancomycin) act in this way.
- Altering cell membrane permeability through direct action on the cell wall, which allows intracellular substances to leak out and destabilizes the cell. Polyene antifungals (amphotericin) work by this mechanism.
- Altering protein synthesis by binding to bacterial ribosomes (50/30) or affecting ribosomal function, which leads to cell death or slowed growth respectively. Aminoglycosides (gentamicin), macrolides (erythromycin), tetracyclines (doxycycline), lincosamides (clindamycin), and the miscellaneous antiinfective chloramphenicol use this action.
- Inhibiting DNA or RNA, including messenger RNA (mRNA), synthesis by binding to nucleic acids or interacting with enzymes required for their synthesis. Antitubercular agents (rifampin), nitroimidazoles (metroNIDAZOLE), antiviral agents (acyclovir), antiretroviral agents (stavudine), and quinolones (ciprofloxacin) act like this.
- Inhibiting the metabolism of folic acid and folinic acid or other cellular components that are essential for bacterial cell growth. The miscellaneous antiinfective trimethoprim employs this mechanism of action. (From Page C et al: *Integrated Pharmacology,* ed 3, St. Louis, 2006, Mosby.)

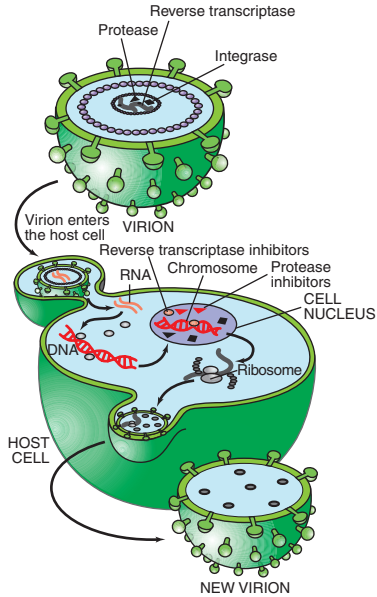



**Fig. G-6 Mechanisms and Sites of Action: Antiretroviral Agents.** When viruses reproduce, the infectious viral particle, or virion **(A),** enters the host cell. The virion attaches to the cell's surface and then inserts itself into the host cell **(B).** Once inside, the virion uncoats, and the enzyme reverse transcriptase makes two copies of the viral RNA: one copy is identical; the other is a mirror image. These two copies form double-stranded viral DNA that enters the host cell's nucleus, where it inserts itself into the host cell's DNA with the help of the enzyme integrase. Then viral DNA reprograms the host cell to produce additional viral RNA, which begins the process of forming new viruses. Specifically, messenger RNA (mRNA) instructs ribosomal RNA (rRNA) to produce a new chain of proteins and enzymes that are used to form new viruses. Protease cuts the chains, creating individual proteins. These combine with new RNA to create new virions, which bud and are released from the host cell **(C).**

Antiretroviral agents target specific enzymes during viral reproduction. Nucleoside reverse transcriptase inhibitors, such as stavudine, interfere with the action of reverse transcriptase by mimicking naturally occurring nucleosides. Nucleotide reverse transcriptase inhibitors, such as tenofovir, block reverse transcriptase by competing with the natural substrate deoxyadenosine triphosphate and by causing DNA chain termination. Nonnucleoside reverse transcriptase inhibitors, such as delavirdine, work by directly binding to reverse transcriptase. As a result, no viral DNA is available to insert itself into the host cell's DNA. Protease inhibitors, such as indinavir, bind to and interfere with the action of protease; thus, the new chain of proteins formed by rRNA cannot be cut into individual proteins to make new viruses. (From Gutierrez K: *Pharmacotherapeutics: Clinical Reasoning in Primary Care,* ed 2, Philadelphia, 2008, Saunders.)

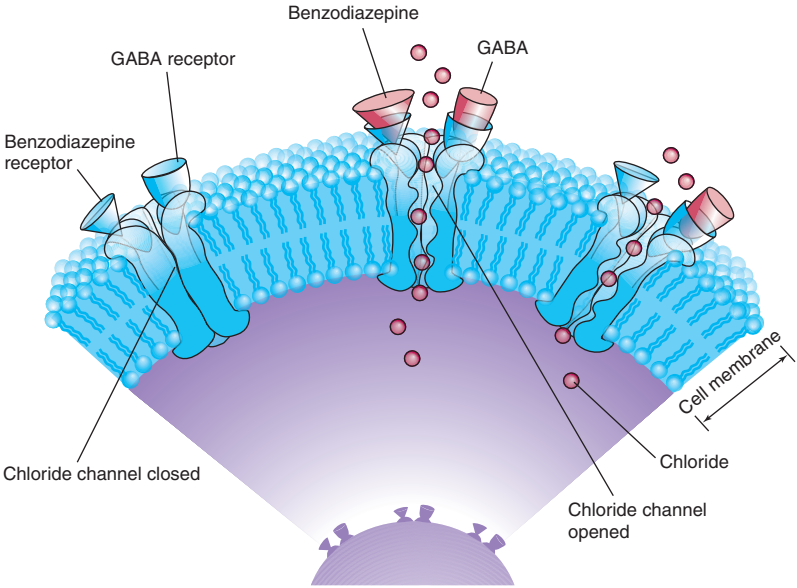



**Fig. G-7 Mechanisms of Action: Benzodiazepines.** Benzodiazepines reduce anxiety by stimulating the action of the inhibitory neurotransmitter, gamma-aminobutyric acid (GABA), in the limbic system. The limbic system plays an important role in the regulation of human behavior. Dysfunction of GABA neurotransmission in the limbic system may be linked to the development of certain anxiety disorders.

The limbic system contains a highly dense area of benzodiazepine receptors that may be linked to the antianxiety effects of benzodiazepines. These benzodiazepine receptors are located on the surface of neuronal cell membranes and are adjacent to GABA receptors. The binding of a benzodiazepine to its receptor enhances the affinity of a GABA receptor for GABA. In the absence of a benzodiazepine, the binding of GABA to its receptor causes the chloride channel in the cell membrane to open, which increases the influx of chloride into the cell. This influx of chloride results in hyperpolarization of the neuronal cell membrane and reduces the neuron's ability to fire, which is why GABA is considered an inhibitory neurotransmitter.

A benzodiazepine acts only in the presence of GABA. When it binds to a benzodiazepine receptor, it prolongs the time that the chloride channel remains open. This results in greater depression of neuronal function and a reduction in anxiety. (From Gutierrez K: *Pharmacotherapeutics: Clinical Reasoning in Primary Care,* ed 2, Philadelphia, 2008, Saunders.)

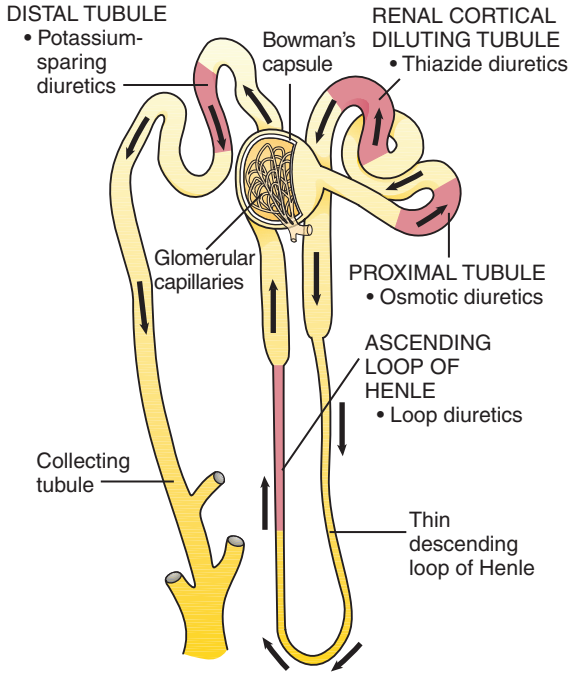



**Fig. G-8 Sites of Action: Diuretics.** Diuretics act primarily to increase water and sodium excretion by the kidneys, thereby increasing urine output. In the process, chloride, potassium, and other electrolytes may also be excreted. Most diuretics act by blocking sodium, water, and chloride reabsorption by peritubular capillaries in the nephrons. As a result, water and electrolytes remain in the convoluted tubules to be excreted as urine. The increased water and electrolyte excretion reduces blood volume—and ultimately blood pressure.

Diuretics belong to four major subclasses:

1. Thiazide diuretics, such as hydrochlorothiazide, act in the early portion of the distal convoluted tubule, called the cortical diluting segment. These drugs block sodium, chloride, and water reabsorption and promote their excretion along with potassium.
2. Loop diuretics, such as furosemide, act primarily in the thick ascending limb of the loop of Henle, blocking sodium, water, and chloride reabsorption. Then these substances are excreted along with potassium.
3. Potassium-sparing diuretics, such as spironolactone, act in the late portion of the distal convoluted tubule and collecting tubule. Here, they inhibit the action of aldosterone, leading to sodium excretion and potassium retention. Although triamterene and amiloride, two other potassium-sparing diuretics, act at the same site, they do not affect aldosterone. Instead, these drugs directly block the exchange of sodium and potassium, leading to decreased sodium reabsorption and decreased potassium excretion.
4. Osmotic diuretics, such as mannitol, work in the proximal convoluted tubule. As their name implies, these diuretics increase the osmotic pressure of the glomerular filtrate, inhibiting the passive reabsorption of water, sodium, and chloride. (From Gutierrez K: *Pharmacotherapeutics: Clinical Reasoning in Primary Care,* ed 2, Philadelphia, 2008, Saunders.)

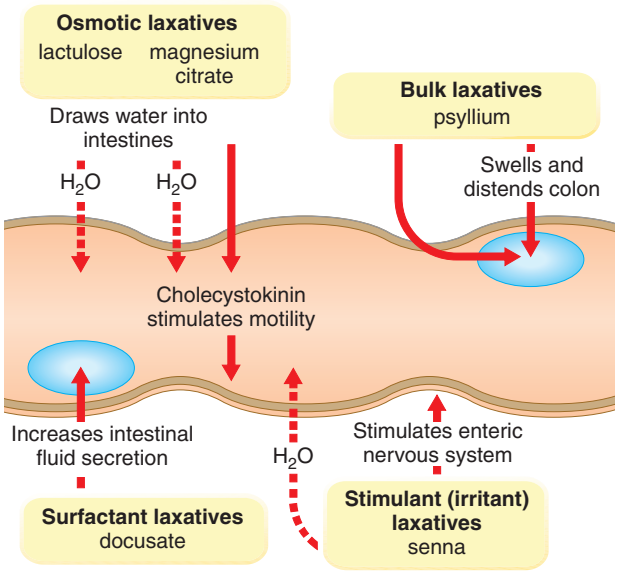



**Fig. G-9 Mechanisms of Action: Laxatives.** Laxatives ease or stimulate defecation. Typically, they are classified by their mechanism of action as bulk-forming, osmotic, stimulant, or surfactant laxatives.

Bulk-forming laxatives, such as psyllium, act in the small and large bowel. Because ingredients in these laxatives are undigestible, they remain within the stool and increase the fecal mass by drawing in water. These agents also enhance bacterial growth in the colon, further adding to the fecal mass.

Osmotic laxatives, such as lactulose, draw water into the intestinal lumen, causing the fecal mass to soften and swell. This osmotic action may be enhanced by the metabolism of colonic bacteria to lactate and other organic acids. These acids decrease colonic pH and increase colonic motility.

Stimulant (or irritant) laxatives, such as senna, act on the intestinal wall to increase water and electrolytes in the intestinal lumen. In addition, they directly irritate the colon, increasing motility.

Surfactant laxatives (or fecal softeners), such as docusate, reduce the surface tension of the stool, allowing water to enter it. These laxatives may also help to increase water and electrolyte excretion into the intestinal lumen, softening and increasing the fecal mass. (From Page C et al: *Integrated Pharmacology,* ed 3, St. Louis, 2006, Mosby.)

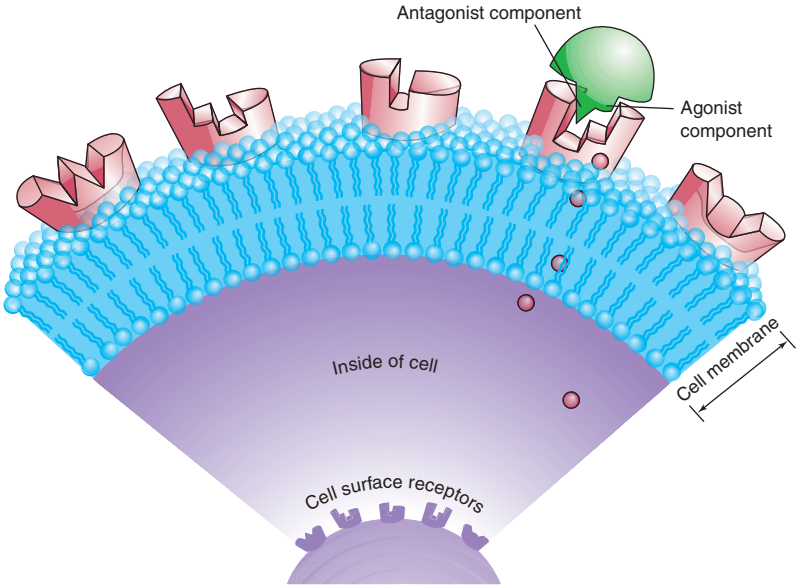



**Fig. G-10 Mechanisms of Action: Narcotic Agonist-Antagonist Analgesics.** Cell membranes have different types of opioid receptors, such as mu, kappa, and delta receptors. Opioid agonist-antagonists work by stimulating one type of receptor, while simultaneously blocking another type. As agonists, they work primarily by activating kappa receptors to produce analgesia and such other effects as CNS and respiratory depression, decreased GI motility, and euphoria. As antagonists, they compete with opioids at mu receptors, helping to reverse or block some of the other effects of agonists. (From Gutierrez K: *Pharmacotherapeutics: Clinical Reasoning in Primary Care,* ed 2, Philadelphia, 2008, Saunders.)

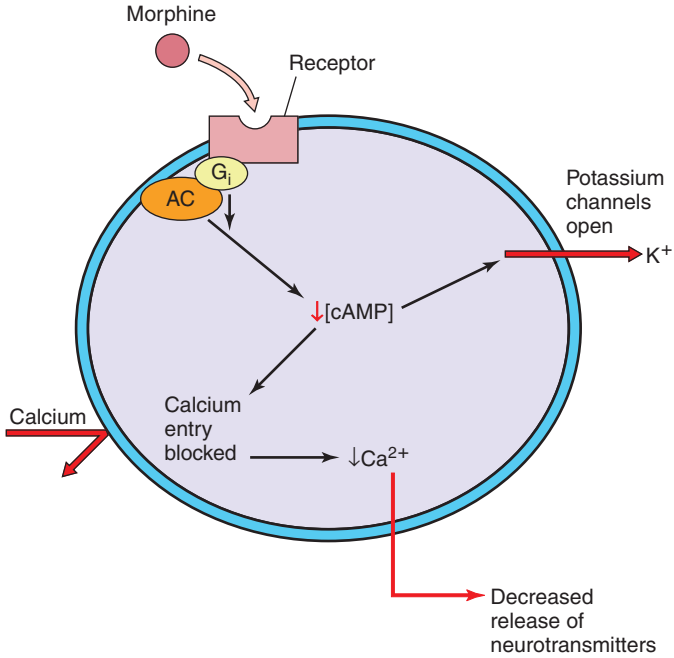



**Fig. G-11 Mechanisms of Action: Narcotic Analgesics.** Narcotic analgesics bind to three types of opioid receptors: mu, kappa, and delta receptors. They produce analgesia primarily by activating mu receptors. However, they also engage with and activate kappa and delta receptors, producing other effects, such as sedation and vasomotor stimulation.

When morphine or another narcotic analgesic binds to opioid receptors, activation occurs. The receptors send signals to the enzyme adenyl cyclase (AC) to slow activity by way of G proteins ($G_i$). Decreased adenyl cyclase activity causes reduced production of cyclic adenosine monophosphate (cAMP). A secondary messenger substance, cAMP is important for regulating cell membrane channels. A reduced cAMP level allows fewer potassium ions to leave the cell and blocks calcium ions from entering the cell. This ion imbalance—especially the reduced intracellular calcium level—ultimately decreases the release of neurotransmitters from the cell, thereby blocking or reducing pain impulse transmission. (From Minneman KP, Wecker L: *Brody's Human Pharmacology: Molecular to Clinical,* ed 4, St. Louis, 2005, Mosby.)

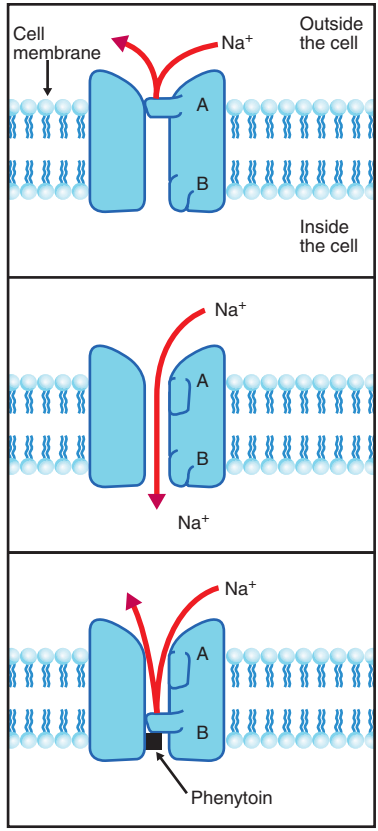



**Fig. G-12 Mechanisms of Action: Phenytoin.** Phenytoin, which is used to treat tonic-clonic seizures, acts in the motor cortex and brain stem, where the tonic phase of tonic-clonic seizures originates. By altering sodium transport across neuronal cell membranes, phenytoin stabilizes the cell membrane, reduces repetitive firing of the neurons, and halts or limits the spread of seizures. The first illustration shows a neuronal cell membrane in its resting state. The activation gate **(A)** of the sodium channel in the cell membrane is closed and blocks sodium ($Na^+$) from entering the cell. In the second illustration, a nerve impulse has caused depolarization and opening of the activation gate, allowing $Na^+$ to move into the cell. In the third illustration, depolarization continues and an inactivation gate **(B)** moves into the channel. This prevents $Na^+$ from moving into the cell. Phenytoin prolongs the inactivated state of the sodium channel by preventing reopening of the inactivation gate. By further preventing $Na^+$ from entering the cell, phenytoin slows impulse transmission, and thus slows the rate at which neurons fire. (From Minneman KP, Wecker L: *Brody's Human Pharmacology: Molecular to Clinical,* ed 4, St. Louis, 2005, Mosby.)

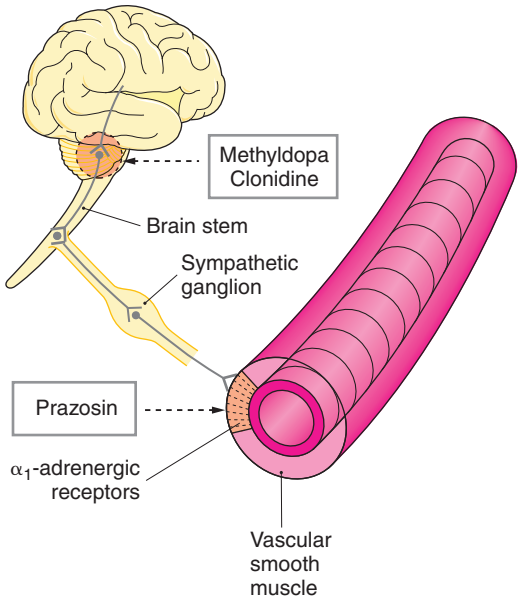



**Fig. G-13 Sites of Action: Sympatholytics.** Sympatholytics inhibit sympathetic nervous system (SNS) activity, which plays a major role in regulating B/P. Normally when the SNS is stimulated, nerve impulses travel from the cardiovascular center of the CNS to the sympathetic ganglia. From there, the impulses travel along postganglionic fibers to specific effector organs, such as the heart and blood vessels. SNS stimulation also triggers the release of norepinephrine, which acts primarily at alpha-adrenergic receptors.

Sympatholytics fall into two subclasses: central-acting $\alpha_2$ agonists and peripheral-acting $\alpha_1$-adrenergic antagonists. Central-acting $\alpha_2$ agonists, such as methyldopa and cloNIDine, stimulate $\alpha_2$-adrenergic receptors in the cardiovascular center of the CNS and reduce activity in the vasomotor center of the brain, interfering with sympathetic stimulation of the heart and blood vessels. This causes blood vessel dilatation and decreased cardiac output, which leads to reduced B/P.

Peripheral-acting $\alpha_1$-adrenergic antagonists, such as prazosin, inhibit the stimulation of $\alpha_1$-adrenergic receptors by norepinephrine in vascular smooth muscle, interfering with SNS-induced vasoconstriction. As a result, the blood vessels dilate, reducing peripheral vascular resistance and venous return to the heart. These effects, in turn, lead to decreased B/P. (From Prosser S, Worster B, Dewar K: *Applied Pharmacology for Nurses and Other Health Care Professionals,* St. Louis, 2000, Mosby.)

# Appendix H

## Photo Atlas of Drug Administration



**Fig. H-1 Administering an Injection.** Cleanse site with antiseptic swab. Apply swab at center of site and rotate outward in circular direction for about 5 cm (2 in). (From Perry AG, Potter PA, and Elkin MK: *Nursing Interventions & Clinical Skills,* ed 5, St. Louis, 2012, Mosby.)

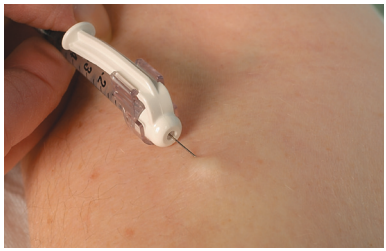


**Fig. H-2 Intradermal Injection.** For an intradermal injection, note formation of small bleb approximately 6 mm (¼ in) in diameter at injection site. (From Perry AG, Potter PA, and Elkin MK: *Nursing Interventions & Clinical Skills,* ed 5, St. Louis, 2012, Mosby.)

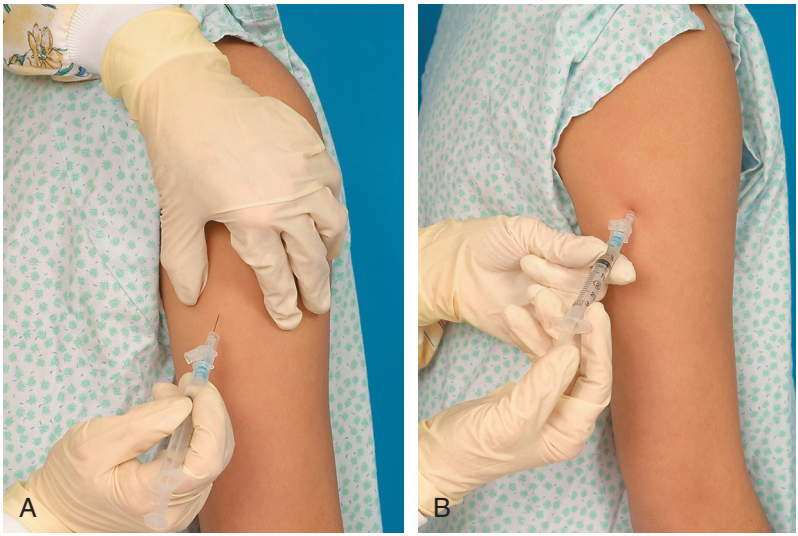



**Fig. H-3 Subcutaneous Injection. A,** For a subcutaneous injection, hold the syringe between the thumb and forefinger of the dominant hand as a dart, with the palm down. **B,** After injecting the needle at a 45- to 90-degree angle, grasp lower end of syringe barrel with nondominant hand to end of plunger. Avoid moving syringe while slowly pulling back on plunger to aspirate drug. If blood appears in syringe, remove needle, discard medication and syringe, and repeat procedure. *Exception:* Do not aspirate when giving heparin. (From Perry AG, Potter PA, and Elkin MK: *Nursing Interventions & Clinical Skills,* ed 5, St. Louis, 2012, Mosby.)

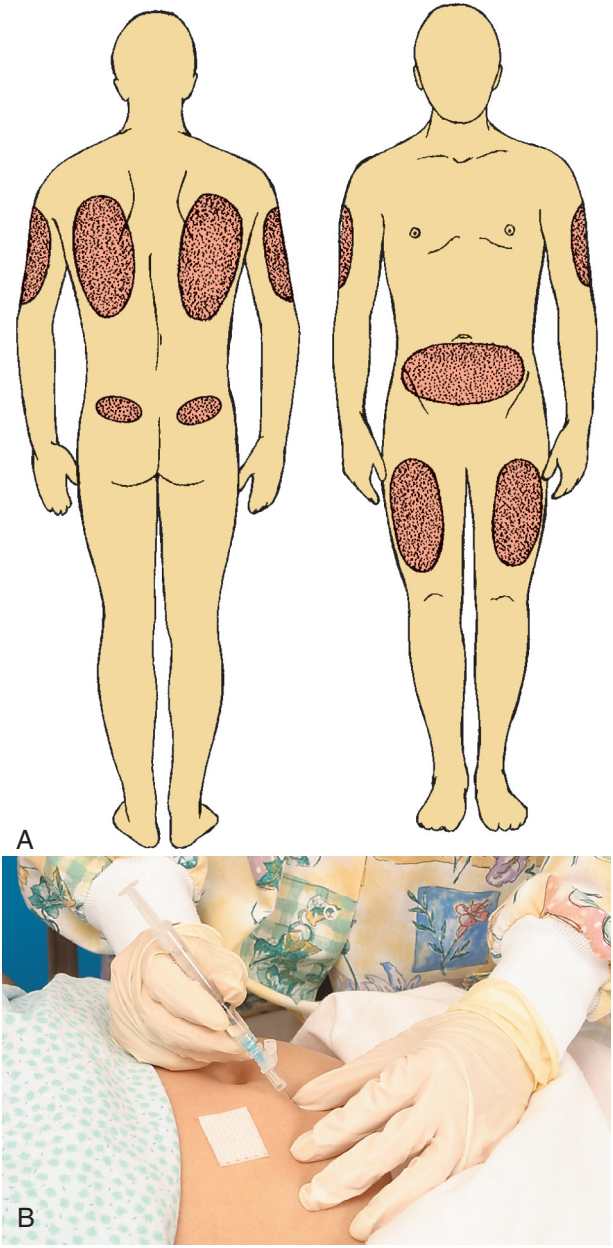



**Fig. H-4 Subcutaneous Injection. A,** Sites recommended for subcutaneous injections. **B,** Giving subcutaneous injection in the abdomen. (From Perry AG, Potter PA, and Elkin MK: *Nursing Interventions & Clinical Skills,* ed 5, St. Louis, 2012, Mosby.)

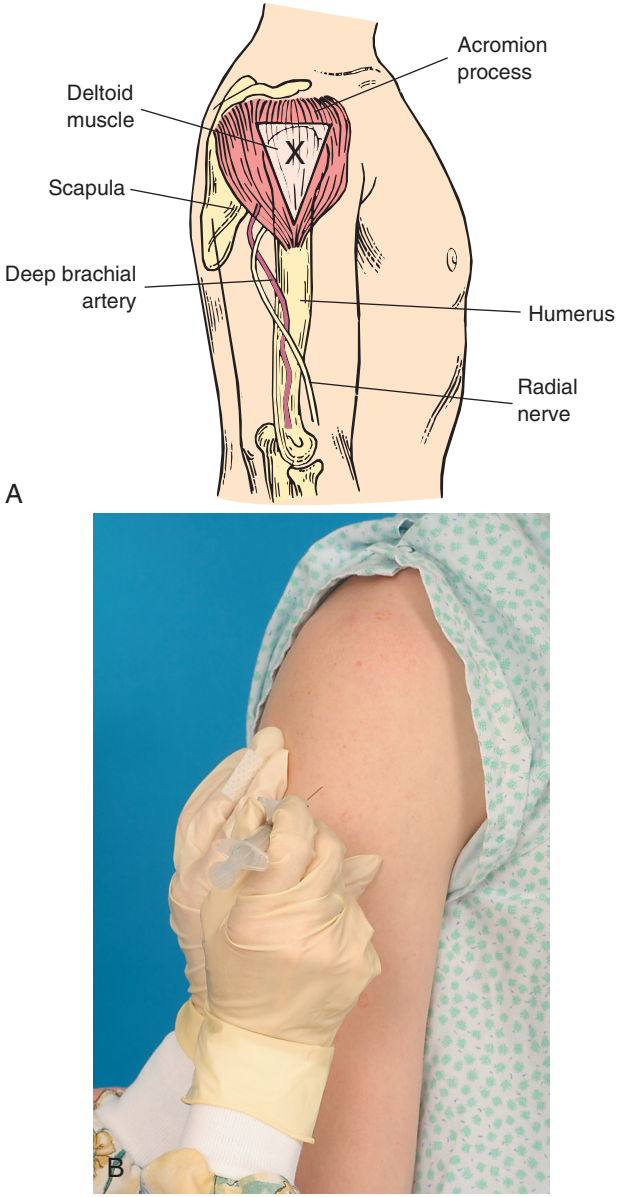



**Fig. H-5 Deltoid Intradermal Injection.** **A,** Landmarks for IM injection into the deltoid muscle. **B,** Giving IM injection in deltoid muscle. (From Perry AG, Potter PA, and Elkin MK: *Nursing Interventions & Clinical Skills,* ed 5, St. Louis, 2012, Mosby.)

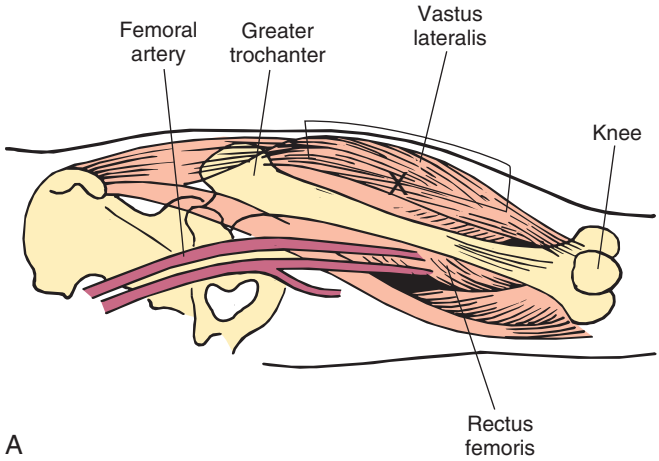






**Fig. H-6 Vastus Lateralis Intramuscular Injection. A,** Landmarks for IM injection in vastus lateralis. **B,** Giving IM injection in vastus lateralis site. (From Perry AG, Potter PA, and Elkin MK: *Nursing Interventions & Clinical Skills,* ed 5, St. Louis, 2012, Mosby.)

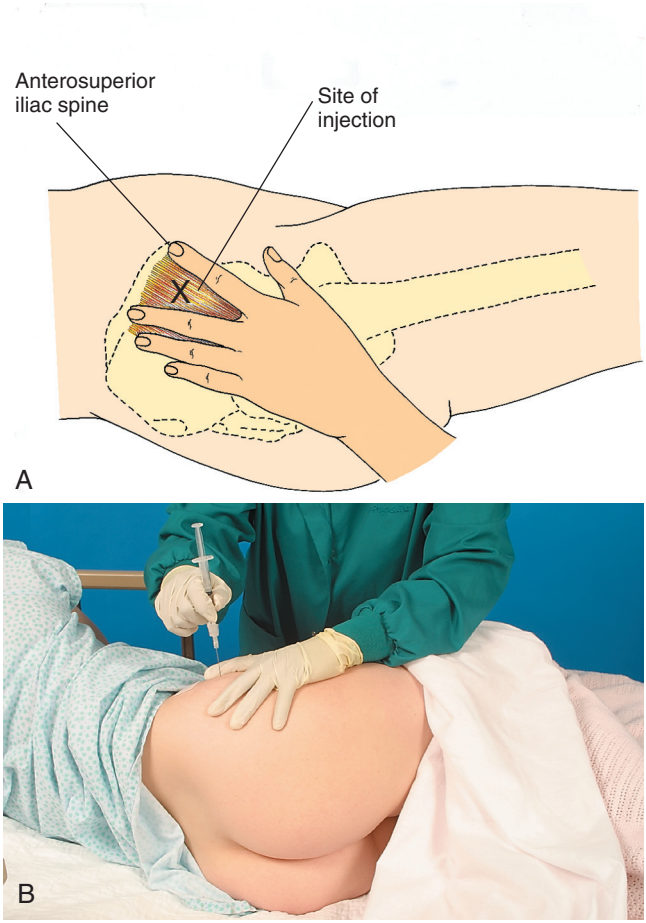



**Fig. H-7 Ventrogluteal Intramuscular Injection. A,** Anatomical view of ventrogluteal site. **B,** Giving IM injection into ventrogluteal muscle to avoid major nerves and blood vessels. (From Perry AG, Potter PA, and Elkin MK: *Nursing Interventions & Clinical Skills,* ed 5, St. Louis, 2012, Mosby.)

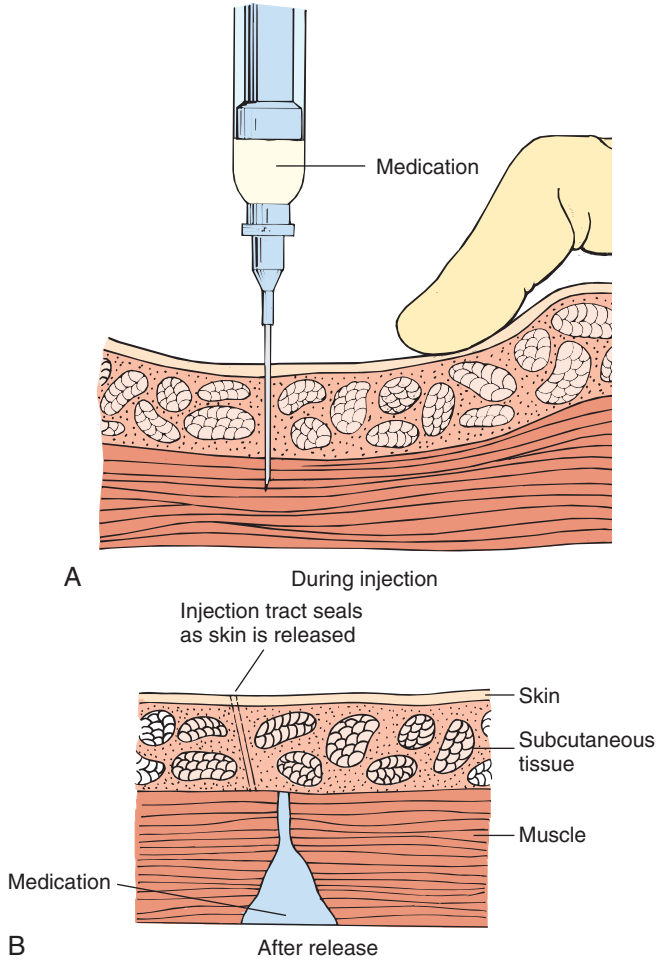



**Fig. H-8 Z-Track Method of Injection.** **A,** Pulling on overlying skin during IM injection moves tissues to prevent later tracking. **B,** The Z-track left after injection prevents the deposit of medication through sensitive tissue. (From Perry AG, Potter PA, and Elkin MK: *Nursing Interventions & Clinical Skills,* ed 5, St. Louis, 2012, Mosby.)

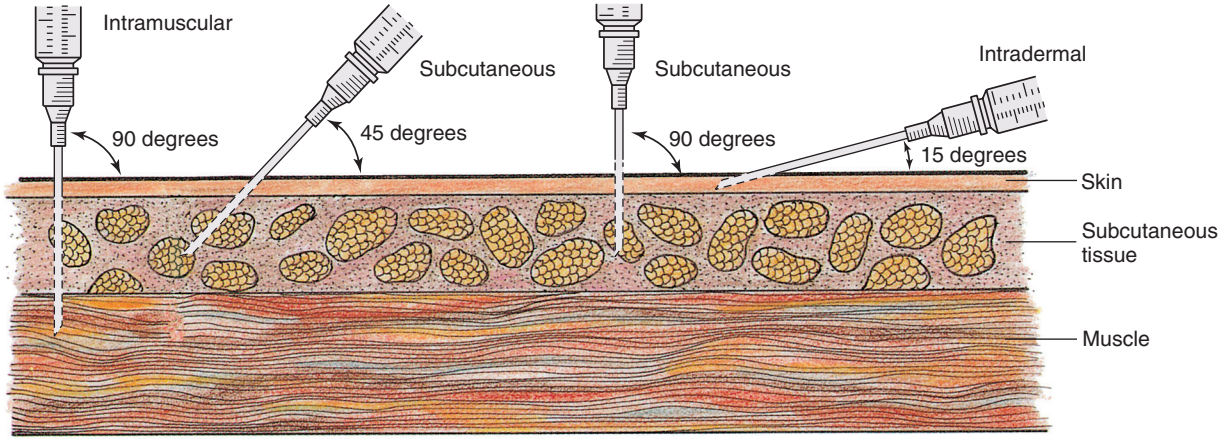



**Fig. H-9 Comparison of Needle Angles.** Comparison of angles of insertion for IM (90 degrees), SUBCUT (45 degrees and 90 degrees), and ID (15 degrees) injections. (From Potter PA, Perry AG: *Fundamentals of Nursing,* ed 7, St. Louis, 2009, Mosby.)

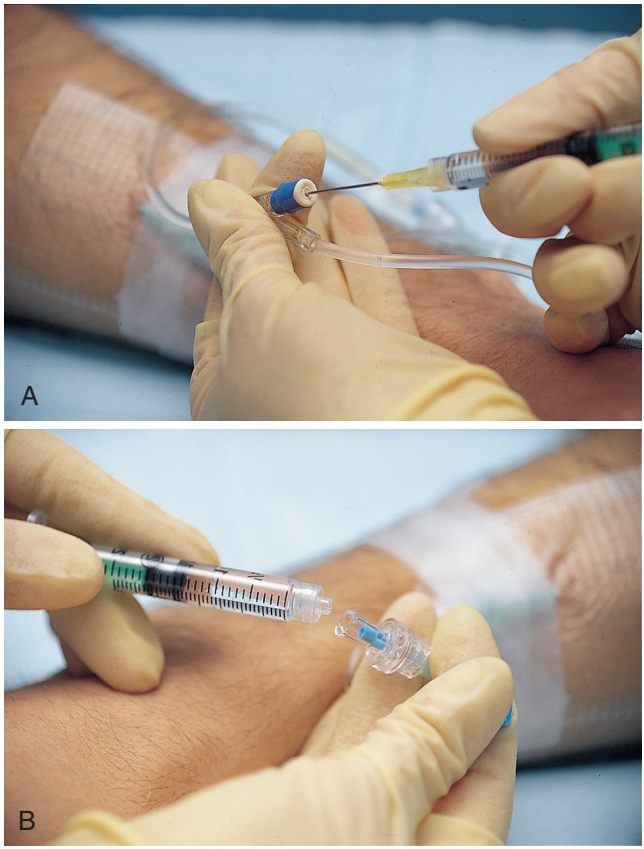



**Fig. H-10 Administering Medication by IV Bolus (push). A,** Needle system: Insert small-gauge needle of syringe containing prepared drug through center of injection port. **B,**Needleless system: Remove cap of needleless injection port. Connect tip of syringe directly. (From Potter PA, Perry AG: *Fundamentals of Nursing,* ed 6, St. Louis, 2005, Mosby.)

*Continued*

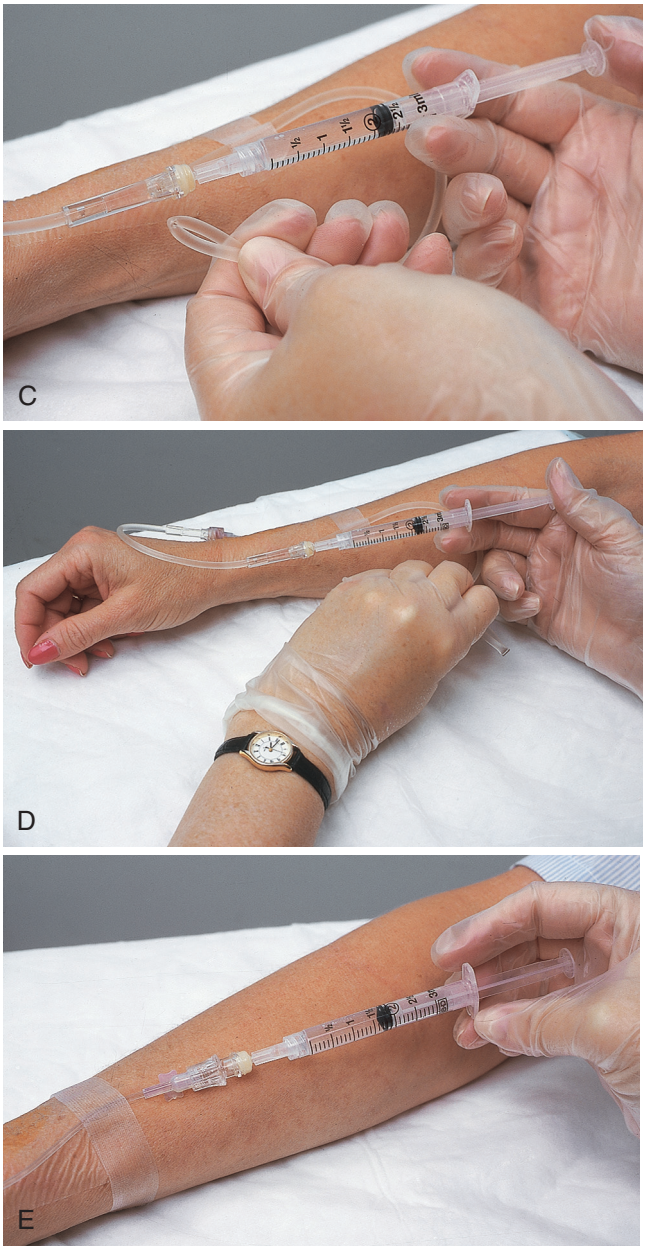



**Fig. H-10, cont'd C,** Occlude **IV** line by pinching tubing just above injection port. Pull back gently on syringe's plunger to aspirate blood return. **D,** After noting blood return, continue to occlude tubing and inject medication slowly over several minutes (read directions on drug package). Use watch to time administration. **E, IV** lock: Insert needle of syringe containing prepared drug through center of diaphragm. (From Potter PA, Perry AG: *Fundamentals of Nursing,* ed 6, St. Louis, 2005, Mosby.)

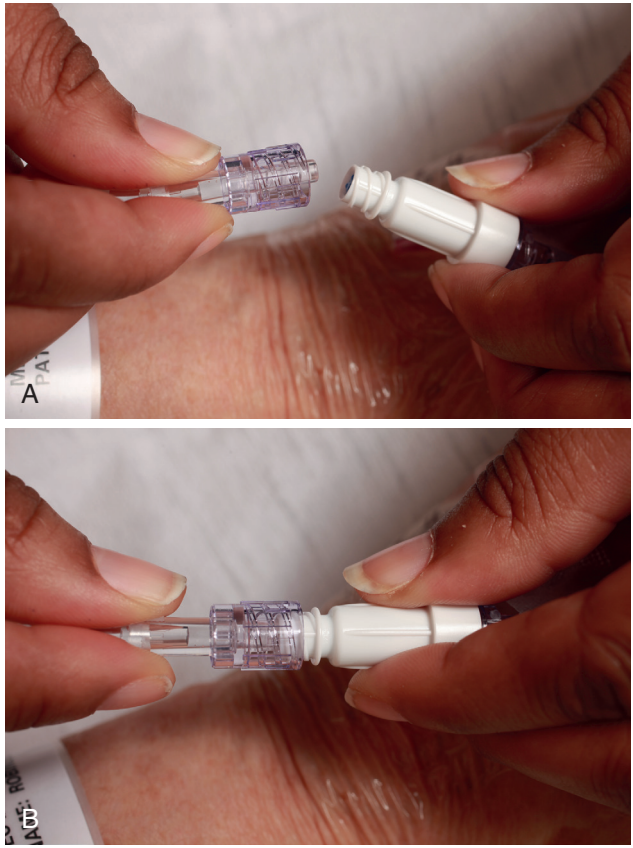



**Fig. H-11 Administering IV Medication by Piggyback, Volume Administration Sets of Miniinfusors (Syringe Pump).** Use needle-lock device to secure needle of secondary piggyback line through injection port of main line. (From Perry AG, Potter PA, and Elkin MK: *Nursing Interventions & Clinical Skills,* ed 5, St. Louis, 2012, Mosby.)

This page intentionally left blank

# Index



222AF, 7–9
4-Way Nasal Spray, 1154
5-ASA, 625–626
5 rights of medication administration, 1227

**A**

A-hydroCort, 494–497
A-Methapred, 645–647
abacavir, 1–2
abaloparatide, 1113–1114
abatacept, 2–4
Abbreviations, 1165–1166t
Abelcet, 61–63
abemaciclib, 1114–1116
Abenol, 7–9
Abilify, 79–81
Abilify Discmelt, 79–81
Abilify Maintena, 79–81
abiraterone, 4–5
ABLC, 61–63
Abraxane, 752–754
Abreva, 1158
Absorbine Athlete's Foot Cream, 1156
Abstral, 418
acalabrutinib, 1116
acarbose, 5–7
Accolate, 1061
AccuNeb, 24–27
Accupril, 833–835
Accuretic, 833–835
Acerca C, 1050–1051
ACET, 7–9
Aceta, 7–9
Acetab, 7–9
Acetadote, 11–13
acetaminophen, 7–9
acetaZOLAMIDE, 9–11
acetylcholine, 1152
acetylcysteine, 11–13
acetylsalicylic acid, 83–85
Acid Control, 412–414
Acid Reducer, 845–847
Aciphex, 838–839
Aciphex Sprinkle, 838–839
Actemra, 985–988
Actimmune, 532
Actiq, 418–421
Activase, 38–40
Actonel, 863–864
Actonel DR, 863–864
Actos, 788–789
Acular, 549–551, 1152
Acuvail, 1152
acyclovir, 13–15, 1157
Adacel, 1161–1164t
Adalat CC, 707–709
Adalat XL, 707–709
adalimumab, 16–17
Adcetris, 133–134
Adcirca, 937–938
adefovir, 17–18
Adenocard, 18–19
Adenoscan, 18–19
adenosine, 18–19
Adlyxin, 594–596
Administering the drugs. *See* Photo atlas of drug administration
ado-trastuzumab, 19–22
Adoxa, 332–335
Adrenaclick, 357
Adrenalin, 357–360
Adrenalin Nasal Solution, 1154
Adriamycin, 327–329
Adrucil, 434–437
Advil, 504
afatinib, 22
Afeditab CR, 707–709
Afinitor, 398–404
Afinitor Disperz, 398–407
Afluria, 1161–1164t
Afrezza, 524
Afrin No Drip, 1154
Afstyla, 74
Aggrastat, 979–981
Airborne, 11–13
Airomir, 24–27
AK-Con, 1153
Akten, 1151
Aktob, 982–985
Alavert, 597–598
Alaway, 1151
albiglutide, 22–24
Albumarc, 24
albumin, human 5%, 24
albumin, human 25%, 24
Albuminar-5, 24
Albuminar-25, 24
Albutein 5%, 24
Albutein 25%, 24
albuterol, 24–27
alcaftadine, 1151
Alcaine, 1151
Aldactone, 919–921

Alecensa, 1116
alectinib, 1116
alemtuzumab, 27
alendronate, 27–28
Alertec, 674–675
Aleve, 695–697
Alfen, 479–480
alfuzosin, 28–29
Alimta, 771–773
Aliqopa, 1127–1129
alirocumab, 29–30
aliskiren, 30–31
Alka-Mints, 153–154
Alkeran, 616–619
All Clear AR Maximum Strength Ophthalmic Solution, 1153
All Clear Eye Drops, 1153
Allegra, 424–425
Allerdryl, 307–309
Allergy formula, 307–309
Allergy 24 HR Nasal Spray, 1154
Aller-Max, 307–309
Alloprin, 31–33
allopurinol, 31–33
almotriptan, 33–34
alogliptin, 34–35
Alomide, 1153
Alophen, 121–122
Aloprim, 31–33
Alora, 386
alosetron, 35–36
Aloxi, 758–759
ALPHA-ADRENERGIC BLOCKERS, 1076
Alphagan P, 1152
Alphamin, 1049
ALPRAZolam, 36–38
Alrex, 1152
Alsoxa, 332–335
ALSUMA Auto-injector, 929–930
Altabax, 1157
Altace, 843–844
Altarussin, 479–480
Altaryl, 307–309
Altavera, 239
alteplase, 38–40
Altoprev, 603–604
Alu-Tab, 40–41
Alugel, 40–41
aluminum hydroxide, 40–41
Alunbrig, 1123
alvimopan, 41–42
Alyacen 1/35, 239
amantadine, 42–44
Amaryl, 471
Ambien, 1073–1074
Ambien CR, 1073–1074
AmBisome, 63–66
ambrisentan, 44
Amerge, 697–698
Americaine Anesthetic, 1158
amikacin, 45–48
aMILoride, 48–49
Aminess, 50–51
amino acid, 50–51
Aminofen, 7–9
Aminosyn, 50–51
amiodarone, 51–53
Amitone, 153–154
amitriptyline, 53–55
amLODIPine, 55–56
amoxicillin, 57–59
amoxicillin/clavulanate, 59–61
Amoxil, 57–59
Amphojel, 40–41
amphotericin B lipid complex (ABLC), 61–63
amphotericin B liposomal (LAmB), 63–66
ampicillin, 66–68
ampicillin/sulbactam, 68–70
Ampicin, 66–68
Ampyra, 264–265
Amrix, 245–247
Anacobin, 1049
Anafranil, 224–226
anakinra, 70–71
Anaprox, 695–697
Anaprox DS, 695–697
anastrozole, 71–72
Anbesol Maximum Strength, 1158
Ancef, 175
Androderm, 961
AndroGel Fortesta, 961
Anectine, 923–924
ANESTHETICS
  general, 1076–1077
  local, 1076–1077
  ophthalmic products, 1151, 1153
  topical, 1158
Anexate, 433–434
Anexsia, 491
Angiomax, 125–127
anidulafungin, 72–74
ANTACIDS, 1077
Antara, 416–417
anthrax vaccine, 1161–1164t
ANTI-ALZHEIMER AGENTS, 1077–1078
Anti-Nauseant, 304–305
ANTIANGINALS, 1078–1079
ANTIANXIETY AGENTS, 1079–1080
ANTIASTHMATICS, 1080–1081
ANTICHOLINERGIC BRONCHODILATORS (sites and mechanisms of action), 1170f
ANTICHOLINERGICS, 1081

ANTICOAGULANTS, 1081–1082
ANTICONVULSANTS, 1082–1083
ANTIDEPRESSANTS, 1083–1084
  mechanisms of action, 1171f
ANTIDIABETICS, 1084–1085
  mechanisms of action, 1172f
ANTIDIARRHEALS, 1085
ANTIDYSRHYTHMICS, 1085–1086
ANTIEMETICS, 1086–1087
Antifungal, 1156
ANTIFUNGALS
  sites and mechanisms of action, 1173f
  systemic, 1087
  topical, 1156–1157
  vaginal, 1159–1160
antihemophilic factor recombinant, single chain, 74
ANTIHISTAMINES, 1088
  nasal agents, 1154
  ophthalmic products, 1151
ANTIHYPERTENSIVES, 1088–1089
ANTIINFECTIVES, 1089–1090
  ophthalmic products, 1151–1152, 1153
  otic, 1160
  sites and mechanisms of action, 1174f
  topical, 1157
ANTIINFLAMMATORIES, 1153
ANTILIPIDEMICS, 1090–1091
ANTINEOPLASTICS, 1091–1092
ANTIPARKINSONIAN AGENTS, 1092–1093
ANTIPLATELETS, 1093
ANTIPSYCHOTICS, 1093–1094
ANTIPYRETICS, 1094–1095
ANTIRETROVIRALS, 1095
  sites and mechanisms of action, 1175f
ANTITUBERCULARS, 1095–1096
ANTITUSSIVES/EXPECTORANTS, 1096–1097
Antivert, 612–613
ANTIVIRALS, 1097
  topical, 1157–1158
Anzemet, 317–318
Apacet, 7–9
APAP, 7–9
APC-ASA Coated Aspirin, 83–85
Apidra, 524
Apidra SoloStar, 524
Aplenzin, 143–145
Apo-Alpraz, 36–38
Apo-Alpraz TS, 36–38
Apo-Amilzide, 48–49
Apo-Amoxi, 57–59
Apo-Amoxi Clav, 59–61
Apo-Ampi, 66–68
Apo-Asa, 83–85
Apo-C, 1050–1051
Apo-Cal, 153–154
Apo-Capto, 162–164
Apo-Cefadroxil, 175
Apo-Diclo, 293
Apo-Diltiaz, 302–304
Apo-Doxy, 332–335
Apo-Erythro, 376
Apo-Erythro-ES, 376
Apo-Erythro-S, 376–380
Apo-Folic, 443–445
Apo-Hydrol, 489–491
Apo-Hydroxyquine, 499–500
Apo-ISDN, 544
Apo-ISMN, 544–546
Apo-Keto, 548–549
Apo-Levocarb, 572–575
Apo-Metoclop, 647–649
Apo-Napro-Na, 695–697
Apo-Pen-VK, 775
Apo-Sulfatrim, 925–927
Apo-Tamox, 938–940
Apo-Timol, 974–975
Apo-Triazo, 1013–1014
Apo-Verap, 1035–1038
Apra, 7–9
apraclonidine, 1152
apremilast, 74–75
aprepitant, 75
Apresoline, 487–489
Apri, 239
Apri-28, 239
Apriso, 625–626
Aptiom, 382–383
Aptivus, 978–979
Aquasol A, 1047–1049
Aquasol E, 1052–1053
Aralen, 198–200
Aranesp, 272–273
Arava, 564–566
Arcapta Neohaler, 519–521
Aredia, 759–761
Arestin, 663–665
arformoterol, 76–78
Argatroban, 78–79
Aricept, 319–320
Aridol Bronchial Challenge test kit, 610–612
Arimidex, 71–72
ARIPiprazole, 79–81
Aristospan, 1010–1013
Arixtra, 445–446
Armour Thyroid, 968
Arnuity Ellipta, 441
Aromasin, 408
ASA, 83–85
A.S.A., 83–85
Asacol, 625–626

Asacol HD, 625–626
Asaphen, 83–85
Asatab, 83–85
Ascor L-500, 1050–1051
ascorbic acid, 1050–1051
Ascriptin Enteric, 83–85
asenapine, 81–83
Aspergum, 83–85
Aspir-Low, 83–85
Aspirin, 83–85
aspirin (acetylsalicylic acid, ASA), 83–85
aspirin/omeprazole, 85
Aspirtrin, 83–85
Astagraf XL, 934
Astepro, 1154
Astramorph PF, 677–683
Atacand, 159–160
Atarax, 500–501
Atasol, 7–9
atazanavir, 85–87
atazanavir/cobicistat, 87–89
Atelvia, 863–864
atenolol, 89–90
atezolizumab, 91
Ativan, 598–600
atomoxetine, 91–92
atorvastatin, 92–93
atovaquone, 93–94
Atralin, 1157
atropine, 94–96, 1152
Atrovent, 534–535
Atrovent HFA, 534–535
Aubagio, 957–958
Aubra, 239
Augmentin, 59–61
Augmentin ES, 59–61
Augmentin XR, 59–61
Austedo, 1130
Avandia, 881–882
Avapro, 536–537
Avastin, 119–120
Aveed, 960
Avelox, 683–685
Avelox IV, 683–685
avelumab, 1116–1118
Aventyl, 718–720
Aviane-28, 239
AVINza, 677–683
Avirat, 13–15
Avita, 1009–1010, 1157
Avodart, 339–340
Avonex, 528
Axert, 33–34
axicabtagene ciloleucel, 1118–1121
Axiron, 961
axitinib, 96–98
azaCITIDine, 98–99
Azasan, 99–100
AzaSite, 102–105, 1151
azaTHIOprine, 99–100
azelaic acid, 1157
azelastine, 101, 1151, 1154
Azelex, 1157
Azilect, 849–850
azilsartan, 101–102
azithromycin, 102–105, 1151
Azolen, 1156
Azopt, 1152
Azulfidine, 927–929
Azulfidine EN-tabs, 927–929
Azurette, 240

## B

Bacitin, 1157
bacitracin, 1157
baclofen, 106–107
Bacter-Aid DS, 925–927
Bactrim DS, 925–927
Bactroban, 1157
baking soda, 905–907
Balminil, 289–290, 479–480
Banophen, 307–309
Banzel, 884–885
Baraclude, 355–357
Barriere, 900
Barriere-HC, 1155
Basaljel, 40–41
basiliximab, 107–108
Bavencio, 1116–1118
Baxdela, 1130
Bayer Aspirin, 83–85
Bayer Children's Aspirin, 83–85
Baza, 1156
BCG vaccine, 1161–1164t
BD Posiflush, 483–487
Beben, 1155
beclomethasone, 108–110, 1154
Beconase AQ Nasal, 1154
Bedoz, 1049
Bekyree, 240
belatacept, 110–112
Belbuca, 141–143
Beleodaq, 113–115
belimumab, 112–113
belinostat, 113–115
Belsomra, 932–933
Belviq, 601–602
Benadryl, 307–309
Benadryl Allergy, 307–309
Benadryl Allergy Dye Free, 307–309
Benadryl Children's Allergy, 307–309
benazepril, 115–116
bendamustine, 116–117

Bendeka, 116–117
Benlysta, 112–113
Bensal HP, 1157
Bentyl, 295
Bentylol, 295
Benylin, 307–309
Benylin Chest Congestion Extra Strength, 479–480
Benylin E, 479–480
benzocaine, 1158
BENZODIAZEPINES (mechanisms of action), 1176f
benztropine, 117–119
besifloxacin, 1151
Besivance, 1151
Besponsa, 1136–1139
β-ADRENERGIC BLOCKERS, 1097–1098
ophthalmic products, 1152, 1153
Betacort, 1155
Betagen, 1152
Betalin S, 967
betamethasone, 1155
betamethasone (augmented), 1155
Betanate, 1155
Betapace, 917–919
Betapace AF, 917–919
Betaseron, 528–532
Betaxin, 967
betaxolol, 1152
Betaxon, 1152
Bethkis, 982–985
Betimol, 1152
Betnovate, 1155
Betoptic, 1152
bevacizumab, 119–120
Bevyxxa, 1121–1122
bextrixaban, 1121–1122
Beyaz, 239
bezlotoxumab, 120–121
Biamine, 967
Biaxin, 218–220
Biaxin XL, 218–220
Bicholate, 121–122
Bicillin L-A, 775
Bidex, 479–480
bimatoprost, 1153
Binosto, 27–28
Bio-Throid, 968
BioCal, 153–154
BioThrax, 1161–1164t
BIPHASIC CONTRACEPTIVES, 240
Biphentin, 641–645
bisacodyl, 121–122
Bismatrol, 122–124
Bismed, 122–124
Bismutal, 479–480
bismuth subsalicylate, 122–124
Bismylate, 122–124
bisoprolol, 124–125
bivalirudin, 125–127
Blenoxane, 127–129
bleomycin, 127–129
Bleph-10, 1151
Boil-Ease, 1158
BONE RESORPTION INHIBITORS, 1098–1099
Bonine, 612–613
Boniva, 502–503
Boostrix, 1161–1164t
bortezomib, 129–131
bosentan, 131–132
Bosulif, 132–133
bosutinib, 132–133
Branch Amin, 50–51
brentuximab, 133–134
Brevibloc, 383–385
Brevicon, 239
brexpiprazole, 1122–1123
Bricanyl, 956–957
Briellin, 239
brigatinib, 1123
Brilinta, 969–970
brimonidine, 1152
Brineura, 1127
Brintellix, 1057–1058
brinzolamide, 1152
Brisdelle, 766–768
brivaracetam, 1124–1125
Briviact, 1124–1125
brodalumab, 1125–1126
bromfenac, 1152
bromocriptine, 135–136
Bronchophan, 479–480
Brosch-Neut, 905–907
Brovana, 76–78
Buckley's Bedtime, 307–309
Buckley's Mixture, 289–290
Budeprion SR, 143–145
budesonide, 136–138, 1154
Bufferin, 83–85
bumetanide, 138–140
Bumex, 138–140
Buminate 5%, 24
Buminate 25%, 24
Buprenex, 141–143
buprenorphine, 141–143
Buproban, 143–145
buPROPion, 143–145
Burinex, 138–140
BuSpar, 145–146
BuSpar Dividose, 145–146
Buspirex, 145–146
busPIRone, 145–146
Bustab, 145–146

busulfan, 147
Busulfex, 147
butoconazole, 1159
butorphanol, 147–149
Butrans, 141–143
Bydureon, 408–409
Byetta, 408–409
Bystolic, 698–699
Byvalson, 699

C

C1 esterase inhibitor subcutaneous, human, 1126–1127
Cal-Citrate, 154–157
Calan, 1035–1038
Calan SR, 1035–1038
Calcarb, 153–154
Calci-Chew, 153–154
Calci-Mix, 153–154
Calciday, 153–154
Calciferol, 1051–1052
Calcijex, 151–152
Calcimar, 150–151
Calcite, 153–154
calcitonin (salmon), 150–151
calcitriol, 151–152
calcium acetate, 153
calcium carbonate, 153–154
CALCIUM CHANNEL BLOCKERS, 1099
calcium chloride, 154, 155–156
calcium citrate, 154, 155
Calcium glubionate calcionate, 154
calcium gluceptate, 154
calcium gluconate, 154–155
calcium phosphate, 154
calcium salts, 154–157
CaldeCORT, 1155
Caldolor, 504
Calmex, 307–309
Calmylin Expectorant, 479–480
Calphron, 153
Calquence, 1116
Caltine, 150–151
Caltrate, 153–154
Cambia, 293
Camila, 240
Camptosar, 537–539
canagliflozin, 157–159
Canasa, 625–626
candesartan, 159–160
Canesten, 1156, 1159
capecitabine, 160–162
Capoten, 162–164
captopril, 162–164
Carac, 434–437
Carafate, 924–925
carbachol, 1152
carBAMazepine, 164–166
Carbatrol, 164–166
Carbolith, 593–594
CARBONIC ANHYDRASE INHIBITORS, 1152, 1153
carbonyl iron, 422
CARBOplatin, 166–169
Cardene IV, 703–705
Cardene SR, 703–705
CARDIAC GLYCOSIDES, 1099–1100
Cardizem, 302–304
Cardizem CD, 302–304
Cardizem LA, 302–304
Cardura, 324–325
Cardura XL, 324–325
carisoprodol, 169–170
carteolol, 1152
Carter's Little Pills, 121–122
Cartia XT, 302–304
carvedilol, 170–172
Cataflam, 293
Catapres, 228–230
Catapres-TTS, 228–230
Cathflo, 38–40
Ceclor, 178
Cedax, 183
cefaclor, 178, 179, 180, 181
cefadroxil, 175, 176, 177
ceFAZolin, 175, 176–177
cefdinir, 183, 184–185, 186, 188
cefditoren pivoxil, 183, 185, 186, 188–189
cefepime, 183–184, 185, 186, 189
cefixime, 183, 184, 185, 186, 189
Cefixime, 183
Cefizox, 183
Cefotan, 178
cefotaxime, 183, 184, 185–187, 189
cefoTEtan, 178, 179, 181, 182
cefOXitin, 178, 179–180, 181, 182
cefpodoxime, 183, 184, 186, 187, 189
cefprozil, 179, 180, 181, 182
ceftaroline, 172–173
cefTAZidime, 183, 184, 186, 187–188, 189
ceftibuten, 183, 184, 186, 188, 189
Ceftin, 179
ceftizoxime, 183, 184, 186, 188, 190
cefTRIAXone, 183, 184, 186, 188, 190
cefuroxime, 179, 180, 181–182
Cefuroxime, 179
Cefzil, 179
CeleBREX, 173–175
celecoxib, 173–175
Celestoderm, 1155
CeleXA, 216–218
Cenestin, 389
Cenolate, 1050–1051

Centany, 1157
cephalexin, 175, 176, 177, 178
CEPHALOSPORINS
  1st generation, 175–178
  2nd generation, 178–183
  3rd/4th generation, 183–191
Ceptaz, 183
Cerebyx, 451–453
ceritinib, 191–192
cerliponase alfa, 1127
certolizumab pegol, 192–194
Cerubidine, 274, 275
Cervidil, 305–306
C.E.S., 389
cetirizine, 194–195, 1151
Cetraxal, 1160
cetrorelix, 195
Cetrotide, 195
cetuximab, 195–197
Cetylev, 11–13
Champix, 1028–1029
Chantix, 1028–1029
Chateal, 239
Children's Claritin RediTabs, 597–598
Children's Feverall, 7–9
chlordiazePOXIDE, 197–198
chloroquine, 198–200
chlorproMAZINE, 200–202
Cholac, 555–557
cholecalciferol, 1051–1052
cholestyramine, 202–204
CHOLINERGIC BLOCKERS, 1101
CHOLINERGICS, 1100–1101
  direct-acting, 1152
  ophthalmic products, 1152
CHOLINESTERASE INHIBITORS, 1152
Chooz, 153–154
Chronovera, 1035–1038
Cialis, 937–938
cidofovir, 204–205
Cidomycin, 468–471
cilostazol, 205–207
Ciloxan, 1151
cimetidine, 207–209
Cimzia, 192–194
cinacalcet, 209–210
Cipralex, 380–382
Cipralex Meltz, 380–382
Cipro, 210–212
Cipro XR, 210–212
ciprofloxacin, 210–212, 1151, 1160
cisatracurium, 213
CISplatin, 214–216
citalopram, 216–218
Citracal, 154–157
Citrocarbonate, 905–907
Claforan, 183
clarithromycin, 218–220
Claritin, 597–598
Claritin Eye, 1151
clavulanate, 220
Clavulin, 59–61
Cleocin HCl, 221
Cleocin Pediatric, 221
Cleocin Phosphate, 221–223
Cleocin T, 1157
clevidipine, 220–221
Cleviprex, 220–221
Climara, 386
Clindacin ETZ, 1157
Clindacin PAC, 1157
clindamycin, 1157
clindamycin HCl, 221
clindamycin palmitate, 221
clindamycin phosphate, 221–223
clobetasol, 1155
Clobex, 1155
Clomid, 223–224
clomiPHENE, 223–224
clomiPRAMINE, 224–226
clonazePAM, 226–228
cloNIDine, 228–230
clopidogrel, 230–231
Clotrimaderm, 1156
clotrimazole, 1156, 1159
cloZAPine, 231–234
Clozaril, 231–234
Cobex, 1049
cobimetinib, 1127
Cobolin-M, 1049
codeine, 234–235
Codulax, 121–122
Cogentin, 117–119
Colace, 314–315
colchicine, 235–237
ColciGel, 235–237
Colcrys, 235–237
colesevelam, 237–238
Colocort, 494
Commit, 705
Complera, 346–349
Compro, 812–814
Comtan, 354–355
Concerta, 641–645
Congest, 389
conivaptan, 238–239
conjugated estrogens, 389
Constilac, 555–557
Constulose, 555–557
CONTRACEPTIVES, HORMONAL, 239–242
  biphasic, oral, 240
  emergency, 240
  extended cycle, oral, 240
  implant, 240

CONTRACEPTIVES, HORMONAL *(Continued)*
intrauterine, 240
monophasic, oral, 239–240
progestin, oral, 240
progressive estrogen, oral, 240
transdermal, 240
triphasic, oral, 240
vaginal ring, 240
ConZip, 997–999
copanlisib, 1127–1129
Coradur, 544
Cordarone, 51–53
Cordran, 1155
Coreg, 170–172
Coreg CR, 170–172
Corgard, 688–689
Cormax, 1155
Correctol, 314–315
Cortacet, 1155
Cortalo, 1155
Cortate, 1155
Cortef, 494, 1155
Cortena, 494
CORTICOSTEROIDS, 1101–1102
ophthalmic products, 1152
Corticreme, 1155
Cortifoam, 1155
Cortoderm, 1155
Corvert, 507–508
Cosentyx, 891
Cotazym, 761–762
Cotellic, 1127
cotrimoxazole, 925–927
Cough Syrup Expectorant, 479–480
Coumadin, 1059–1060
Covera, 1035–1038
Covera-HS, 1035–1038
Cozaar, 602–603
Creon, 761–762
Cresemba, 541–543
Crestor, 882–884
Crinone, 814–816
crizotinib, 242–245
crofelemer, 245
Cruex, 1156
Crux, 1156
Cryselle, 240
Crystamine, 1049
Crysti-1000, 1049
Cubicin, 270–271
Cutivate, 1155
CVS Maximum Redness Relief Eye Drops, 1153
CVS Redness Relief Lubricant Eye Drops, 1153
Cyanabin, 1049
cyanocobalamin, 1049
Cyanoject, 1049
Cyclafem 1/35, 239
Cyclessa, 239
cyclobenzaprine, 245–247
Cyclogyl, 1152
cyclopentolate, 1152
cyclophosphamide, 247–249
Cycloset, 135–136
cycloSPORINE, 249
cycloSPORINE, modified, 249–252
Cylate, 1152
Cymbalta, 337–339
Cyomin, 1049
cytarabine, 252
cytarabine liposomal, 252–254
Cytosar, 252
Cytotec, 669–670
Cytovene, 461–463
Cytoxan, 247

## D

dabigatran, 255–256
dabrafenib, 256–258
dacarbazine, 258–259
daclatasvir, 259–261
daclizumab, 262–263
Dacodyl, 121–122
Daklinza, 259–261
Dalacin C, 221
Dalacin C Flavored Granules, 221
Dalacin C Phosphate Sterile Solution, 221–223
dalbavancin, 263–264
dalfampridine, 264–265
Daliresp, 876–877
dalteparin, 265–267
Dalvance, 263–264
Dantrium, 267–268
dantrolene, 267–268
dapagliflozin, 268–270
Daptacel, 1161–1164t
DAPTOmycin, 270–271
daratumumab, 1129
darbepoetin, 272–273
darifenacin, 273–274
Darzalex, 1129
Dasetta 1/35, 239
DAUNOrubicin, 274, 275–276
DAUNOrubicin citrate liposome, 274–277
daunorubicin/cytarabine, 1130
DaunoXome, 274–277
Daytrana, 641–645
DDAVP, 282–284
DDAVP Rhinal Tube, 282–284
DDAVP Rhinal Drops, 282–284
ddI, 295–297

DECONGESTANTS
nasal, 1154
ophthalmic products, 1153
Del-Beta, 1155
Del-Vi-A, 1047–1049
delafloxacin, 1130
Delatestryl, 960
delavirdine, 277–278
Delestrogen, 386
Delsym 12-Hour, 289–290
Delta-D, 1051–1052
Deltoid intradermal injection, 1186f
Delzicol, 625–626
Demarest, 1157
Demerol, 620–622
Denavir, 1157
denosumab, 278–280
Depacon, 1021
Depakene, 1021
Depakote, 1021–1023
Depakote ER, 1021–1023
Depo-Cyt, 252–254
Depo Dur, 677–683
Depo-Estradiol, 386
Depo-Medrol, 645–647
Depo-Provera, 240, 613–615
Depo-subQ Provera, 613–615
Depo-Subq Provera 104, 240
Depo-Testosterone, 960
DepoDur, 682
Derma-Smoothe/FS oil, 1155
Dermasorb TA, 1155
Dermovate, 1155
Desenex, 1156
desipramine, 280–282
desmopressin, 282–284
Desogen, 239
Desonate, 1155
desonide, 1155
DesOwen, 1155
desoximetasone, 1155
desoxyribonuclease, 284
desvenlafaxine, 284–285
Detrol, 991–992
Detrol LA, 991–992
deutetrabenazine, 1130
dexamethasone, 285, 1152
dexamethasone sodium phosphate, 285–288
Dexasone, 285
Dexilant, 288–289
dexlansoprazole, 288–289
dextromethorphan, 289–290
DiaBeta, 473–474
Diabetic Tussin, 479–480
Diamode, 596
Diamox, 9–11
Diastat, 290–293
Diazemuls, 290–293
diazePAM, 290–293
dibucaine, 1158
diclofenac, 293–295, 1152
diclofenac epolamine, 293
diclofenac potassium, 293
dicyclomine, 295
didanosine, 295–297
difenoxin with atropine, 297
Dificid, 425–426
Diflucan, 430–432
Diflucan Canesoral, 430–432
Digitek, 298–302
digoxin, 298–302
dihydroergotamine, 302
Dilacor XR, 302–304
Dilantin, 782–785
Dilantin Infatabs, 782–785
Dilatrate-SR, 544
Dilaudid, 497–499
Dilaudid-HP, 497–499
Dilt-CD, 302–304
Diltia XR, 302–304
Diltia XT, 302–304
dilTIAZem, 302–304
Diltzac, 302–304
dimenhyDRINATE, 304–305
Dimetapp, 597–598
dinoprostone, 305–306
Diocaine, 1151
Diocto, 314–315
Diovan, 1023–1025
Dipentum, 730–731
Diphedryl, 307–309
Diphenhist, 307–309
diphenhydraMINE, 307–309
diphtheria, tetanus, pertussis, polio vaccine IPV, 1161–1164t
diphtheria and tetanus toxoids, adsorbed, 1161–1164t
diphtheria and tetanus toxoids and whole-cell pertussis vaccine (DPT, DTP), 1161–1164t
diphtheria and tetanus toxoids and acellular pertussis vaccine, 1161–1164t
Diprivan, 819–821
Diprolene AF, 1155
Dirate, 304–305
DIRECT-ACTING MIOTICS, 1153–1154
Ditropan, 743–744
Ditropan XL, 743–744
DIURETICS, 1102–1103
sites of action, 1177f
divalproex sodium, 1021–1023
Divigel, 386–389

Dixanit, 228–230
Diyaril, 228–230
DOBUTamine, 309–311
Docefrez, 311–314
DOCEtaxel, 311–314
docosanol, 1158
Docu DOK, 314–315
Doculace, 314–315
docusate calcium, 314
docusate sodium, 314–315
dofetilide, 315–317
dolasetron, 317–318
Dolophine, 628–630
dolutegravir, 318–319
dolutegravir/rilpivirine, 1130–1131
donepezil, 319–320
DOPamine, 320–322
Doribax, 322–324
doripenem, 322–324
Dormex, 307–309
Doryx, 332–335
dorzolamide, 1152
doxazosin, 324–325
doxepin, 325–327
Doxiden, 121–122
Doxil, 329–332
DOXOrubicin, 327–329
DOXOrubicin liposomal, 329–332
Doxy, 332–335
Doxycaps, 332–335
Doxycin, 332–335
doxycycline, 332–335
doxycycline calcium, 332–335
doxycycline hyclate, 332–335
doxycycline monohydrate, 332–335
DPT vaccine, 1161–1164t
Dramamine, 304–305
Dramamine Less Drowsy Formula, 612–613
Drenison 1/4, 1155
Drenison Tape, 1155
Driminate, 304–305
Drisdol, 1051–1052
Dristan 12-HR Nasal Spray, 1154
dronedarone, 335–336
Drug administration. *See* Photo atlas of drug administration
DTIC, 258–259
DTIC-Dome, 258–259
DTP vaccine, 1161–1164t
DTwP, 1161–1164t
Dual Pack, 657–659
dulaglutide, 336–337
Dulcolax, 121–122, 608
DULoxetine, 337–339
Duodopa, 572–575
dupilumab, 1131
Dupixent, 1131
Duraclon, 228–230
Duragesic, 418
Duramorph PH, 677–683
Duricef, 175
durvalumab, 1131–1134
dutasteride, 339–340
Duzallo, 1140–1141
Dytan, 307

**E**

Ebixa, 619–620
Eceris, 136–138
econazole, 1156
Econopred Plus, 1152
Ecotrin, 83–85
Ecoza, 1156
Ectosone, 1155
edaravone, 1134
Edarbi, 101–102
Edluar, 1073–1074
Edurant, 861–863
EES, 376
efavirenz, 341–342
Effexor, 1033–1035
Effexor XR, 1033–1035
Effient, 799–800
efinaconazole, 1156
Efudex, 434–437
Egrifta, 959–960
Elavil, 53–55
Eldepryl, 892–893
Elestat, 1151
Elestrin, 386–389
eletriptan, 342–343
Elidel, 1158
Eligard, 567–569
Elinest, 240
Eliphos, 153
Elitek, 850–851
Elixophyllin, 965–967
ElixSure Allergy, 307–309
ElixSure Cold, 826
ElixSure Cough, 289–290
Ella, 1018
Ellence, 360–363
Eloxatin, 738–740
Eltor, 826
eltrombopag, 343
Eltroxin, 580–582
Emadine, 1151
Emcin Clear, 1157
emedastine, 1151
Emend, 75
EMERGENCY CONTRACEPTIVES, 240
Emgel, 1157

Emoquette, 239
empagliflozin, 344–345
Emsam, 892–893
emtricitabine, 345–346
emtricitabine/rilpivirine/tenofovir, 346–349
Emtriva, 345–346
Enablex, 273–274
enalapril/enalaprilat, 349–351
enasidenib, 1134
Enbrel, 392–394
Endantadine, 42–44
Endari, 1139
Endodan, 745
Endometrin, 814–816
Enemeez, 314–315
Ener-B, 1049
enfuvirtide, 351–352
Engerix-B, 1161–1164t
Enjuvia, 389–391
EnovaRx, 1158
enoxaparin, 352–354
Enpresse, 239, 240
entacapone, 354–355
entecavir, 355–357
Entereg, 41–42
Entocort EC, 136–138
Entrophen, 83–85
Entyvio, 1030–1031
Enulose, 555–557
enzalutamide, 357
Epclusa, 910–911
Epiklor, 795
epinastine, 1151
EPINEPHrine, 357, 1154
EPINEPHrine HCl, 357–360
EpiPen, 357–360
EpiPen Jr., 357–360
epirubicin, 360–363
Epival, 1021–1023
Epivir, 557–558
Epivir-HBV, 557–558
eplerenone, 363–364
epoetin, 364–367
Epogen, 364–367
Eprex, 364–367
eprosartan, 367–368
eptifibatide, 368–370
Equaline, 83–85
Equaline Allergy, 307–309
Equaline Children's Allergy, 307–309
Equaline Children's Pain Relief, 7–9
Equaline Infant's Pain Relief, 7–9
Equaline Niacin, 703
Equaline Vitamin $B_6$, 829–830
Equaline Vitamin C, 1050–1051
Equetro, 164–166
Eraxis, 72–74
Erbitux, 195–197
ergocalciferol, 1051–1052
eribulin, 370–372
Erivedge, 1046–1047
erlotinib, 372–374
Errin, 240
ertapenem, 374–376
ertugliflozin, 1135
Ery, 1157
Ery Ped, 376
Ery-Tab, 376
Erygel, 1157
Erythro-ES, 376
Erythrocin, 376–380
erythromycin, 376, 1151, 1157
erythromycin base, 376
erythromycin ethylsuccinate, 376
erythromycin lactobionate, 376, 378
erythromycin stearate, 376–380
Esbriet, 792
escitalopram, 380–382
eslicarbazepine, 382–383
esmolol, 383–385
esomeprazole, 385–386
Estrace, 386
Estraderm, 386
estradiol, 386
estradiol cypionate, 386
estradiol gel, 386–389
estradiol topical emulsion, 386
estradiol transdermal spray, 386
estradiol transdermal system, 386
estradiol vaginal ring, 386
estradiol vaginal tablet, 386
estradiol valerate, 386
Estrasorb, 386
Estrayella, 240
Estring, 386
Estrogel, 386–389
estrogens, conjugated, equine, 389
estrogens, conjugated (Synthetic A), 389
estrogens, conjugated (Synthetic B), 389–391
Estrostep, 240
Estrostep Fe, 240
eszopiclone, 391–392
etanercept, 392–394
etelcalcetide, 1135
ethambutol, 394–395
ethinyl estradiol/desogestrel, 239, 240
ethinyl estradiol/drospirenone, 239
ethinyl estradiol/ethynodiol, 239
ethinyl estradiol/etonogestrel, 240
ethinyl estradiol/levonorgestrel, 239, 240
ethinyl estradiol/norelgestromin, 240
ethinyl estradiol/norethindrone, 239–240

ethinyl estradiol/norethindrone acetate, 240
ethinyl estradiol/norgestimate, 240
ethinyl estradiol/norgestrel, 240
Etibi, 394–395
etodolac, 395–397
etonogestrel, 240
etravirine, 397–398
Euflex, 439–440
Euglucon, 473–474
Euthyrox, 580–582
Evamist, 386
everolimus, 398–407
Evista, 839–840
Evocin, 1157
evolocumab, 407–408
Evomela, 616–619
Evotaz, 87–89
Evzio, 693–695
Ex-Lax Ultra Tab, 121–122
Exalgo, 497–499
Exdol, 7–9
Exelon, 874–875
Exelon Patch, 874–875
exemestane, 408
exenatide, 408–409
Expectorant, 479–480
Expectorant Syrup, 479–480
EXPECTORANTS/ANTITUSSIVES, 1096–1097
Extavia, 528–532
EXTENDED CYCLE CONTRACEPTIVES, 240
Extina, 1156
ezetimibe, 409
Ezetrol, 410

## F

Factive, 467–468
Fallback Solo, 240
Falmina, 239
famciclovir, 411–412
famotidine, 412–414
Fampyra, 264–265
Famvir, 411–412
Fanapt, 510–512
Fareston, 997
Farxiga, 268–270
Fasturtec, 850–851
Fazaclo, 231–234
febuxostat, 414–415
Feen-A-Mint, 121–122
felodipine, 415–416
Femara, 566–567
Femcon Fe, 239
Femhrt, 239
Femilax, 121–122
Femiron, 422
Femizole-M, 657–659
Femring, 386
fenofibrate, 416–417
fentaNYL, 418
fentaNYL buccal, 418
fentaNYL lozenge, 418–421
fentaNYL nasal spray, 418
fentaNYL SL, 418
fentaNYL SL spray, 418–420
fentaNYL transdermal, 418
Fentora, 418
Feosol, 422
Feostat, 422
Fer-Gen-Sol, 422
Fer-In-Sol, 422
Fergon, 422
FeroSul, 422
Ferrate, 422
Ferretts, 422
Ferrocite, 422
ferrous fumarate, 422
ferrous gluconate, 422
ferrous sulfate, 422
fesoterodine, 423–424
Fetzima, 579–580
fexofenadine, 424–425
fidaxomicin, 425–426
filgrastim, 426–428
Finacea, 1157
finasteride, 428–429
fingolimod, 429–430
Flagyl, 653–656
Flagyl ER, 653–656
Flagyl IV, 653–656
Flagyl IV RTU, 653–656
Flamazine, 1157
Flarex, 1152
Flector, 293
Fleet (bisacodyl), 121–122
Fleet Enema, 907
Fleet Pedialax, 314–315
Fleet Sof-Lax, 314–315
Flomax, 940–941
Flonase, 440–442
Florazone ER, 653–656
Florinef, 432–433
Flovent Diskus, 440–442
Flovent HFA, 440–442
fluconazole, 430–432
fludrocortisone, 432–433
flumazenil, 433–434
FluMist, 1161–1164t
flunisolide, 1154
fluocinolone, 1155
fluorometholone, 1152
Fluoroplex, 434–437
fluorouracil, 434–437
FLUoxetine, 437–439

flurandrenolide, 1155
flurbiprofen, 1152
flutamide, 439–440
fluticasone, 440–442, 1154, 1155
fluvastatin, 442–443
Fluvirin, 1161–1164t
Fluzone, 1161–1164t
FML, 1152
FML Forte, 1152
FML S.O.P., 1152
folic acid (vitamin $B_9$), 443–445
Folvite, 443–445
fondaparinux, 445–446
Foradil Aerolizer, 446–448
Forfivo XL, 143–145
formoterol, 446–448
Formulex, 295
Fortamet, 626–628
Fortaz, 183
Forteo, 958–959
Fortolin, 7–9
Fosamax, 27–28
Fosamax plus D, 27–28
fosaprepitant, 75–76
foscarnet, 448–450
Foscavir, 448–450
fosinopril, 450–451
fosphenytoin, 451–453
Fragmin, 265–267
FreAmine, 50–51
FreAmine III, 50–51
Frova, 453–454
frovatriptan, 453–454
Furadantin, 711–713
furosemide, 454–457
Fuzeon, 351

## G

gabapentin, 458–460
Gabitril, 968–969
Gablofen, 106–107
galantamine, 460–461
ganciclovir, 461–463, 1151
Garamycin Ophthalmic, 1151
Gardasil, 1161–1164t
Gas Relief, 900
Gas-Relief, 900
Gas-X, 900
gatifloxacin, 1151
Gattex, 943
Gaviscon Prevent, 207–209
Gazyva, 722–724
GBH, 586–587
Gelnique, 743–744
gemcitabine, 463–465
gemfibrozil, 465–466
gemifloxacin, 467–468
Gemzar, 463–465
Gen-Medroxy, 613–615
Gen-Triazolam, 1013–1014
Genapap, 7–9
GENERAL ANESTHETICS, 1076–1077
Generess Fe 0.5/35, 239
Generlac, 555–557
Gengraf, 249–252
Genora 1/35, 239
Genora 1/50, 240
Genotropin, 913–917
Gentak, 1151
gentamicin, 468–471, 1151, 1157
Gentasol, 1151
Geodon, 1066–1068
Gianvil Loryna, 239
Gilenya, 429–430
Gilotrif, 22
Gleevec, 512–514
glibenclamide, 473–474
glimepiride, 471
glipiZIDE, 471–473
Gluco Norm, 853–854
Glucobay, 5–7
GLUCOCORTICOIDS, TOPICAL, 1155–1156
Glucophage, 626–628
Glucophage XR, 626–628
Glucotrol, 471–473
Glucotrol XL, 471–473
Glumetza, 626–628
glyBURIDE, 473–474
Glycon, 626–628
Glydo, 1158
Glynase, 473–474
Gocovri, 42–44
golimumab, 475–476
Good Sense Acetaminophen, 7–9
Good Sense Aspirin, 83–85
Good Sense Children's Pain Relief, 7–9
goserelin, 476
Gralise, 458–460
granisetron, 477–479
Granisol, 477–479
guaiFENesin, 479–480
Guiatuss, 479–480
guselkumab, 1135–1136
Gynazol-1, 1159
Gyne-Lotrimin 3, 1159
Gyne-Lotrimin 7, 1159
Gyne-Trosyd, 1159

## H

H1N1 influenza A (swine flu) virus vaccine, 1161–1164t
Haegarda, 1126–1127

haemophilus b conjugate vaccine, diphtheria $CRM_{197}$ protein conjugate (HbOC), 1161–1164t
haemophilus b conjugate vaccine, meningococcal protein conjugate (PRP-OMP), 1161–1164t
Halaven, 370–372
halcinonide, 1155
Halcion, 1013–1014
Haldol, 481–483
Halfprin, 83–85
Halog, 1155
haloperidol, 481
haloperidol decanoate, 481
haloperidol lactate, 481–483
HandiHaler, 977–978
Harvoni, 562–564
Havrix, 1161–1164t
HbOC vaccine, 1161–1164t
HDCV vaccine, 1161–1164t
Hemanegeol, 821–823
Hemocyte, 422
Hep-Lock, 483–487
Hep-Lock U/P, 483–487
Hepalean, 483–487
heparin, 483–487
Heparin Leo, 483–487
Heparin Lock Flush, 483–487
HepatAmine, 50–51
hepatitis A vaccine, inactivated, 1161–1164t
hepatitis B vaccine, recombinant, 1161–1164t
Hepsera, 17–18
Heptovir, 557–558
Herceptin, 1002–1005
Hetlioz, 942
Hexit, 586–587
HibTITER, 1161–1164t
Histamil, 816–818
HISTAMINE $H_2$ ANTAGONISTS, 1103–1104
H1N1 influenza A (swine flu) virus vaccine, 1161–1164t
homatropine, 1152
Horizant, 458–460
HORMONAL CONTRACEPTIVES, 239. *See also* CONTRACEPTIVES, HORMONAL
HumaLIN 30/70, 524
HumaLIN 70/30, 524
HumaLOG, 524
HumaLOG KwikPen Mix 50/50, 524
HumaLOG Mix 25, 524
HumaLOG Mix 50, 524
HumaLOG Mix 50/50, 524
HumaLOG Mix 75/25, 524
HumaLOG U-200 KwikPen, 524
human papillomavirus recombinant vaccine, quadrivalent, 1161–1164t
Humatrope, 913–917
Humira, 16–17
Humira Pen, 16–17
Humulin 50/50, 524
Humulin N, 524
Humulin R, 524
Humulin RU-500, 524
Hycamtin, 995–997
Hycodan, 491
Hyderm, 1155
hydrALAZINE, 487–489
Hydro Cobex, 1049–1050
Hydro-Crysti-12, 1049
Hydrobexan, 1049
hydrochlorothiazide, 489–491
Hydrocil, 827–828
HYDROcodone, 491
HYDROcodone/acetaminophen, 491
HYDROcodone/ibuprofen, 491–494
hydrocortisone, 494, 1155
hydrocortisone cypionate, 494
hydrocortisone sodium succinate, 494–497
Hydromorph Contin, 497–499
HYDROmorphone, 497–499
hydroxocobalamin, 1049–1050
hydroxychloroquine, 499–500
Hydroxycobal LA-12, 1049–1050
hydrOXYzine, 500–501
HyperRHO S/D, 854
HyperRHO S/D mini-Dose, 854
HYPNOTICS/SEDATIVES, 1108–1109
Hysingla ER, 491

## I

ibandronate, 502–503
Ibrance, 754–755
ibrutinib, 503–504
ibuprofen, 504
ibuprofen lysine, 504–507
Ibuprohm, 504
Ibutab, 504
ibutilide, 507–508
ICAR Pediatric, 422
IDHIFA, 1134
iFerex, 422–423
Ifex, 508–510
ifosfamide, 508–510
Ilevro, 1152
Illustrated mechanisms and sites of action
anticholinergic bronchodilators, 1170f
antidepressants, 1171f
antidiabetic agents, 1172f
antifungal agents, 1173f
antiinfective agents, 1174f
antiretroviral agents, 1175f

Illustrated mechanisms and sites of action *(Continued)*
benzodiazepines, 1176f
diuretics, 1177f
laxatives, 1178f
narcotic agonist-antagonist analgesics, 1179f
narcotic analgesics, 1180f
phenytoin, 1181f
sympatholytics, 1182f
iloperidone, 510–512
Ilotycin, 1151
imatinib, 512–514
Imbruvica, 503–504
Imfinzi, 1131–1134
imipenem/cilastatin, 514–517
imipramine, 517–519
Imitrex, 929–930
Immunization Schedules, 1167. *See also* Vaccines and toxoids
IMMUNOSUPPRESSANTS, 1104–1105
Imodium, 596
Imodium A-D, 596
Imovax, 1161–1164t
Impavido, 663
Implanon, 240
IMPLANT CONTRACEPTIVES, 240
Impril, 517–519
Imuran, 99–100
indacaterol, 519–521
Inderal, 821–823
Inderal LA, 821–823
Inderal XL, 821–823
Indocin, 521–522
indomethacin, 521–522
Infanrix, 1161–1164t
Infantaire, 7–9
Inflectra, 522–524
inFLIXimab, 522–524
Influenza A (H1N1), 1161–1164t
influenza vaccine, 1161–1164t
Infumorph PF, 677–683
Ingrezza, 1150
inhaled insulin, 524
Injection, how to do it. *See* Photo atlas of drug administration
Inlyta, 96–98
InnoPran XL, 821–823
inotuzumab ozogamicin NDG, 1136–1139
Inspra, 363–364
Instacort, 1155
insulin, inhaled, 524, 525
insulin, isophane suspension, 524, 525
insulin, isophane suspension and regular insulin, 524
insulin, regular, 524
insulin, regular concentrated, 524
insulin, regular (ketoacidosis), 525
insulin aspart, 524, 525
insulin aspart mixture, 524
insulin degludec, 524, 525
insulin degludec/liraglutide, 528
insulin detemir, 524, 525
insulin glargine, 524, 525
insulin glargine/lixisenatide, 528
insulin glulisine, 524, 525
insulin (Human), 524
insulin lispro, 524, 525
insulins, 524–528
insulin, inhaled, 524
intermediate acting, 524
long acting, 524
mixtures, 524
rapid acting, 524
short acting, 524
Integrilin, 368–370
Intelence, 397–398
interferon beta-1a, 528, 529–531
interferon beta-1b, 528–532
interferon gamma-1b, 532
interferons beta, 528
Intermezzo, 1073–1074
Intradermal injection, 1183f, 1186f
Intramuscular injection, 1187f, 1188f
INTRAUTERINE CONTRACEPTIVES, 240
INVanz, 374–376
Invega, 755–757
Invega Sustenna, 755–757
Invega Tranza, 755–757
Invokana, 157–159
Ionsys, 418
Iopidine, 1152
ipilimumab, 533–534
IPOL, 1161–1164t
ipratropium, 534–535
irbesartan, 536–537
irinotecan, 537–539
Iron Chews, 422
iron polysaccharide, 422–423
iron sucrose, 540–541
isavuconazonium, 541–543
Isentress, 840–841
Ismo, 544–546
Isochron, 544
IsoDitrate, 544
isoniazid, 543–544
Isopan, 607
isophane insulin suspension (NPH) and insulin mixtures, 524
Isoptin, 1035–1038
Isoptin SR, 1035–1038
Isopto Carbachol, 1152
Isopto Carpine, 1152
Isopto Homatropine, 1152

Isordil, 544
isosorbide dinitrate, 544
isosorbide mononitrate, 544–546
Isotamine, 543–544
IV bolus (push), 1191–1192f
ixabepilone, 546–547
Ixempra, 546–547
Ixiaro, 1161–1164t

J

Jack & Jill, 479–480
Jantoven, 1059–1060
Januvia, 904–905
Japanese encephalitis virus vaccine, inactivated, 1161–1164t
Jardiance, 344–345
Jencycla, 240
Jolessa, 239
Jolivette, 240
Jublia, 1156
Juluca, 1130–1131
Junel 21 1/20, 239
Junel 21 1.5/20, 239
Jurnista, 497

K

K-Effervescent, 794
K-Exit, 907–909
K-G Elixir, 795–796
K-Pek, 122–124
K-Tab, 795
K-Vescent, 794
Kadcyla, 19–22
Kadian, 677–683
Kalexate, 907–909
Kao-Tin, 122–124, 314
Kaon, 795–796
Kaopectate, 122–124
Kaopectate Stool Softener, 314
Kaopectolin, 122–124
Kapvay, 228–230
Karacil, 827–828
Kariva, 239, 240
Kayexalate, 907–909
Kaylixir, 795–796
Keflex, 175
Kefurox, 179
Kefzol, 175
Kelnor 1/35, 239
Kenalog, 1155
Kenalog-10, 1010–1013
Kenalog-40, 1010–1013
Keppra, 571–572
Keppra XR, 571–572
Keralyt, 1157
Kerydin, 1156
ketoconazole, 1156
Ketodan, 1156
ketoprofen, 548–549
ketorolac, 1154
  nasal, 549–551
  ophthalmic, 1152
  systemic, 549–551
ketotifen, 1151
Keytruda, 773–775
Khedezla, 284–285
Kimidess, 240
Kineret, 70–71
Kinrix, 1161–1164t
Kionex, 907–909
Kisqali, 1145–1147
Kitabis, 982–985
KlonoPIN, 226–228
Klor-Con, 795
Klor-Con EF, 794
Koffex, 289–290
Konakion, 785–786
Konsyl Leader First Laxative, 827–828
Kristalose, 555–557
Kuric, 1156
Kuruelo, 239
Kwedella, 586–587
Kymriah, 1149
Kytril, 477

L

L-glutamine, 1139
labetalol, 552–554
lacosamide, 554–555
lactulose, 555–557
LAmB, 63–66
Lamictal, 558–560
Lamictal CD, 558–560
Lamictal ODT, 558–560
Lamictal XR, 558–560
LamISIL, 955–956, 1156
Lamisil AT, 955–956
lamiVUDine (3TC), 557–558
lamoTRIgine, 558–560
lansoprazole, 560–561
Lantus, 524
lapatinib, 562
Larin 1/20, 239
Larin 1.5/30, 239
Larin Fe 1/20, 239
Larin Fe 1.5/30, 239
Lartruvo, 729
Lasasil AF Topical Spray, 1156
Lasix, 454–457
Lastacaft, 1151

latanoprost, 1153
latanoprostene bunod, 1153
Latisse, 1153
Latuda, 605–606
LAXATIVES, 1105
  mechanisms of action, 1178f
Lazanda, 418
Leader Children's Pain Reliever, 7–9
ledipasvir/sofosbuvir, 562–564
leflunomide, 564–566
Lemtrada, 27
Lescol, 442–443
Lescol XL, 442–443
lesinurad/allopurinol, 1140–1141
Lessina, 239
Letairis, 44
letermovir, 1141
letrozole, 566–567
leucovorin, 567
Leukine, 887–889
leuprolide, 567–569
levalbuterol, 569–570
Levaquin, 575–579
Levate, 53–55
Levemir, 524
levETIRAcetam, 571–572
Levitra, 1027–1028
Levlen, 239
Levo-TB, 580–582
levobetaxolol, 1152
levobunolol, 1152
levocabastine, 1151
levodopa-carbidopa, 572–575
levofloxacin, 575–579, 1151
levomilnacipran, 579–580
Levonest, 240
levonorgestrel, 240
Levophed, 717–718
Levora, 239
Levothroid, 580–582
levothyroxine, 580–582
Levoxyl, 580–582
Lexapro, 380–382
Lialda, 625–626
Librium, 197–198
Lidemol, 1155
lidocaine, 1158
lidocaine, ophthalmic, 1151
lidocaine, parenteral, 582–584
Lidomar, 1158
LidoPen Auto-Injector, 582–584
LidoRx, 1158
Lin-Amox, 57–59
linagliptin, 585–586
lindane, 586–587
linezolid, 587–589
Lioresal Intrathecal, 106–107
Lipidil, 416–417
Lipidil EZ, 416–417
Lipidil Supra, 416–417
Lipitor, 92–93
Lipodex, 329–332
Lipofem, 416–417
Lipofen, 416–417
liraglutide, 589–591
lisinopril, 591–593
Lithane, 593–594
lithium, 593–594
Lithobid, 593–594
Livalo, 792–793
Livostin, 1151
lixisenatide, 594–596
Lo/Ovral, 240
LOCAL ANESTHETICS, 1076–1077
lodoxamide, 1153
Loestrin 21 1/20, 239
Loestrin 21 1.5/30, 239
Lofibra, 416–417
LoKara, 1155
Lomine, 295
loperamide, 596
Lopid, 465–466
Lopressor, 651–653
loratadine, 597–598
LORazepam, 598–600
lorcaserin, 601–602
Loryna, 239
Losapan, 607
losartan, 602–603
Losec, 732–733
Lotemax, 1152
Lotensin, 115–116
loteprednol, 1152
Lotrimin AF, 1156
Lotronex, 35–36
lovastatin, 603–604
Lovenox, 352–354
Low-Ogestrel, 240
Lowprin, 83–85
LTA, 1158
Lucentis, 844–845
luliconazole, 1156
Lumigan, 1153
Lunesta, 391–392
Lupron, 567–569
Lupron Depo, 567–569
Lupron Depot-Ped, 567–569
lurasidone, 605–606
Lutera, 239
Luzu, 1156
Lyderm, 1155
Lynparza, 728–729
Lyrica, 807

**M**

M-M-R-II, 1161–1164t
Maalox Antacid, 153–154
Maalox Total Stomach Relief, 122–124
Macrobid, 711–713
Macrodantin, 711–713
Macugen, 769–770
mafenide, 1157
Mag-64, 607
Mag-Ox 400, 608
magaldrate, 607
magnesium chloride, 607
magnesium citrate, 607
magnesium gluconate, 607
magnesium hydroxide, 608
magnesium oxide, 608
magnesium salts, 607
magnesium sulfate, 608–610
Magtrate, 607
mannitol, 610–612
Mapap, 7–9
Maranox, 7–9
Marlissa, 239
Matulane, 811–812
Mavik, 1000–1002
Maxalt, 875–876
Maxalt-MLT, 875–876
Maxidex, 1152
Maxipime, 183
Mazepine, 164–166
measles, mumps, and rubella vaccine, live, 1161–1164t
measles, mumps, rubella, varicella, 1161–1164t
Mebroin, 782–785
Mechanisms and sites of action. *See* Illustrated mechanisms and sites of action
meclizine, 612–613
Meda, 7–9
Medication administration, five rights, 1227
Medrol, 645–647
medroxyPROGESTERone, 240, 613–615
Mefoxin, 178
Megace, 615–616
Megace ES, 615–616
Megace OS, 615–616
megestrol, 615–616
MeKinist, 999–1000
melphalan, 616–619
memantine, 619–620
meningococcal polysaccharide vaccine, 1161–1164t
Menomune-A/C, 1161–1164t
meperidine, 620–622
Meperitab, 620–622
Mephyton, 785–786
Mepron, 93–94
meropenem, 622–625
meropenem/vaborbactam, 1141–1142
Merrem IV, 622–625
mesalamine, 625–626
Mesasal, 625–626
Mestinon, 828–829
Mestinon SR, 828–829
mestranol/norethindrone, 240
Metadate ER, 641, 642–643
Metaderm, 1155
Metadol, 628–630
Metamucil, 827–828
metFORMIN, 626–628
methadone, 628–630
Methadose, 628–630
Methergine, 638–639
Methidate, 641–645
methimazole, 630–631
methotrexate, 631–636
methyldopa/methyldopate, 636–638
methylergonovine, 638–639
Methylin, 641–645
Methylin chew tabs, 641, 642
Methylin ER, 641
Methylin oral sol, 641, 642
methylnaltrexone, 640–641
methylphenidate, 641–645
methylPREDNISolone, 645–647
metipranolol, 1152
metoclopramide, 647–649
Metoject, 631–636
metolazone, 649–651
metoprolol, 651–653
Metozolv ODT, 647–649
MetroCream, 1157
MetroGel, 1157
metroNIDAZOLE, 653–656, 1157
Mevacor, 603–604
Mevinolin, 603–604
Mezavant, 625–626
Miacalcin, 150–151
Micaderm, 1156
micafungin, 656–657
Micardis, 946–947
Micatin, 657–659
Micatin Liquid, 657–659
miconazole, 657, 1156, 1159
miconazole nitrate, 657–659
MICRhoGAM Ultra Filtered Plus, 854
Micro-K, 795
Microgestin, 239
Microzide, 489–491
Midamor, 48–49
midazolam, 659–661

Midol, 504
Midol Extended Relief, 695–697
midostaurin, 1143
milrinone, 661–663
miltefosine, 663
Miltuss EX, 479–480
mini-Gramulin R, 854
Minims Tetracaine, 1151
Minipress, 801–802
Minirin, 282–284
Minitran, 713
Minivelle, 386
Minocin, 663–665
minocycline, 663–665
minoxidil, 665–666
Miochol-E, 1152
mirabegron, 667
Mirapex, 796–797
Mirapex ER, 796–797
Mircette, 239
Mirena, 240
mirtazapine, 667–669
MISCELLANEOUS OPHTHALMICS, 1153
misoprostol, 669–670
Mitigare, 235–237
mitoMYcin, 670–672
mitoXANtrone, 672–674
modafinil, 674–675
Modicon, 239
Moduretic, 48–49
MOM, 608
Monodox, 332–335
Monicure, 430–432
Monistat, 657–659
Monistat 1, 1159
Monistat 3, 657–659, 1159
Monistat 7, 657–659, 1159
Monistat-Derm, 657–659
Monistat Dual-Pak, 657–659
Mono-Linyah, 240
Monocor, 124–125
Monohydrate, 332–335
Monoject Prefill, 483–487
MonoNessa, 240
MONOPHASIC CONTRACEPTIVES, 239–240
montelukast, 675–677
morphine, 677–683
M.O.S., 677–683
Motrin, 504
Motrin IB, 504
Moxatag, 57–59
Moxeza, 683–685, 1151
moxifloxacin, 683–685, 1151
MS Contin, 678
Mucinex, 479–480
Mucinex Allergy, 424–425
Mucinex Moisture, 1154
Mucinex Sinus-Max, 1154
Mucomyst, 11–13
Multaq, 335–336
mupirocin, 1157
MUSCLE RELAXANTS, 1109
Mutamycin, 670–672
My-E, 376–380
Myambutol, 394–395
Mycamine, 656–657
Myclo, 1156, 1159
Mycobutin, 857–859
mycophenolate, 685–687
Mycophenolate Mofetil CellCept, 685–687
Mycostatin, 720–721
MYDRIATICS, 1152
Myfortic, 685–687
Mylanta Gas, 900
Mylanta Gas Relief, 900
Myleran, 147
Mylicon, 900
Myrbetriq, 667
Mysoline, 808
Mytesi, 245
Myzilra, 240

## N

nadolol, 688–689
Nadostine, 720–721
Nadryl, 307–309
nafcillin, 689–691
nalbuphine, 692–693
Naldecon Senior EX, 479–480
Nallpen, 689–691
naloxone, 693–695
Namenda, 619–620
Namenda XR, 619–620
naphazoline, 1153
naproxen, 695–697
naratriptan, 697–698
Narcan, 693–695
NARCOTIC AGONIST-ANTAGONIST ANALGESICS (mechanisms of action), 1179f
NARCOTIC ANALGESICS (mechanisms of action), 1180f
Naropin, 880–881
Nasacort, 1154
NASAL AGENTS
  antihistamines, 1154
  decongestants, 1154
  nonsteroidal antiinflammatories, 1154
  steroids, 1154
NASAL ANTIHISTAMINES, 1154
NASAL DECONGESTANTS, 1154
NASAL STEROIDS, 1154
Nascobal, 1049–1050

Nasofed, 826
Natacyn, 1151
natamycin, 1151
Natesto, 961–963
Natulan, 811–812
Natural Fiber, 827–828
Natural Vegetable Fiber, 827–828
Nature Thyroid, 968
Navelbine, 1045–1046
nebivolol, 698–699
nebivolol/valsartan, 699
Nebupent, 778–780
Necon 0.5/35, 239
Necon 1/50, 240
Necor 7/7/7, 240
N.E.E. 1/35, 239
Needle angles (drug administration), 1190f
nelfinavir, 700–701
Nelova 10/11, 240
Nelova 0.5/35E, 239
Nelova 1/35E, 239
Nelova 1/50m, 240
Neo-Codema, 489–491
Neo-K, 794
Neo-Synephrine, 1154
Neo-Zol, 1156
Neofrin, 1152
Neopap, 7–9
NeoProfen, 504–507
Neoral, 249–252
Neosporin Eczema Anti-Itch, 1155
nepafenac, 1152
NephrAmine, 50–51
neratinib, 1143–1145
Nerlynx, 1143–1145
Nesina, 34–35
Neulasta, 770–771
Neupogen, 426–428
Neuro-K, 829–830
Neuroforte-R, 1049–1050
NEUROMUSCULAR BLOCKING AGENTS, 1105–1106
Neurontin, 458–460
Neut, 905–907
Nevanac, 1152
nevirapine, 701–703
NexIUM, 24hr, 385–386
Nexplanon, 240
Nexterone, 51–53
Ni-Odan, 703
niacin, 703
niacinamide, 703
Niaspan, 703
niCARdipine, 703–705
NicoDerm, 706
Nicoderm CQ, 705–707
Nicorette, 705
nicotine, 705
nicotine chewing gum, 705
nicotine inhaler, 705
nicotine lozenge, 705
nicotine nasal spray, 705
nicotine transdermal, 705–707
Nicotrol, 706
Nicotrol Inhaler, 705, 706
Nicotrol NS, 705
Nifedical XL, 707–709
NIFEdipine, 707–709
Niferex, 422–423
Nikki, 239
nilotinib, 709–710
Nilstat, 720–721
Nimbex, 213
niMODipine, 710–711
Nimotop, 710–711
niraparib, 1145
Nitro-Bid, 713
Nitro-Dur, 713
Nitro-Time, 713
nitrofurantoin, 711–713
Nitrogard SR, 713
nitroglycerin, 713
  extended release caps, 713
  intravenous, 713
  rectal ointment, 713
  sublingual, 713
  topical ointment, 713
  transdermal, 713–715
  translingual spray, 713
Nitrojet, 713
Nitrol, 713
Nitrolingual, 713
Nitromist, 713
Nitronel, 713
Nitropress, 715–717
nitroprusside, 715–717
Nitrostat, 713
nivolumab, 717
Noctiva, 282–284
Nodostine, 1156
NONSTEROIDAL ANTIINFLAMMATORIES, 1106–1107
  nasal agents, 1154
  ophthalmic products, 1152
Nor-Q D, 240
Nora-BE, 240
Norcept-E 1/35, 239
NorCo, 491
Nordette, 239
Norditropin, 913–917
Norditropin Flexpro, 913–917
norepinephrine, 717–718
Norethin 1/35E, 240
Norethin 1/50m, 240

norethindrone, 240
Norinyl 1+35, 240
Norinyl 1+50, 240
Noritate, 1157
Norlestrin 1/50, 240
Norlestrin 2.5/50, 240
Norpramin, 280–282
Nortel 7/7/7, 240
Nortrel 1/35, 240
Nortrel 7/7/7, 240
nortriptyline, 718–720
Norvasc, 55–56
Norvir, 867–869
Novamilor, 48–49
Novamine, 50–51
Novamoxin, 57–59
Novana, 1156
Novantrone, 672–674
Novasen, 83–85
Novo-Alprazol, 36–38
Novo-AZT, 1064–1066
Novo-Carbamaz, 164–166
Novo-Difenac, 293
Novo-Folacid, 443–445
Novo-Furantoin, 711–713
Novo-Gesic, 7–9
Novo Hydrocort, 1155
Novo-Peridol, 481
Novo-Pramine, 517–519
Novo-Rythro, 376–380
Novo-Rythro Encap, 376
Novo-Spiroton, 919–921
Novo-Timol, 974–975
Novo-Trimel, 925–927
Novo-Triptyn, 53–55
Novo-Veramil, 1035–1038
Novo-Zolamide, 9–11
NovoLIN 70/30, 524
NovoLIN 70/30 Prefilled, 524
NovoLIN ge NPH, 524
NovoLIN N, 524
NovoLIN N Prefilled, 524
NovoLIN R, 524
NovoLOG, 524
NovoLOG 70/30, 524
NovoLOG Flexpen, 524
Novolog Mix Flexpen Prefilled Syringe 70/30, 524
NovoLOG PenFill, 524
NovoMix 30, 524
Novonidazole, 653–656
NovoRapid, 524
Novoxapan, 740–741
Noxafil, 793–794
NP Thyroid, 968
Nplate, 877–878
Nu-Alpraz, 36–38
Nu-Amilzide, 48–49
Nu-Amoxi, 57–59
Nu-Ampi, 66–68
Nu-Cimet, 207–209
Nu-Cotrimox, 925–927
Nu-Diclo, 293
Nu-Indo, 521–522
Nu-Iron, 422–423
Nu-Metop, 651–653
Nu-Naprox, 695–697
Nu-Ranit, 845–847
Nubain, 692–693
Nulojix, 110–112
Numorphan, 748–749
Nupercainal, 1158
Nuplazid, 786–788
Nutracort, 1155
Nutropin, 913–917
Nutropin AQ, 913–915
Nuva Ring, 240
Nuzon, 1155
Nyaderm, 1156
Nyamyc, 1156
Nymalize, 710–711
nystatin, 720–721, 1156
Nystop, 1156
Nytol, 307

## O

obinutuzumab, 722–724
Ocella, 239
Octostim, 282–284
octreotide, 724–726
Ocufen, 1152
Ocuflox, 1151
Odan K-20, 795
Odomzo, 917, 1149
Ofirmev, 7–9
ofloxacin, 1151
Ofloxacin, 1160
Ogestrel, 240
Olamorph SR, 678
OLANZapine, 726–728
olaparib, 728–729
olaratumab, 729
Oleptro, 1005–1006
olopatadine, 1151, 1154
olsalazine, 730–731
Olux Topical Foam, 1155
Olysio, 898–900
omalizumab, 731–732
omeprazole, 732–733
Omnicef, 183
Omnipred, 1152
Omnitrope, 913–917
Onbrez Breezhal ER, 519–521

ondansetron, 734–735
Ondissolve, 734–735
Onglyza, 889–890
Opana, 748–749
Opdivo, 717
OPHTHALMIC PRODUCTS
anesthetics, 1151, 1153
antihistamines, 1151
antiinfectives, 1151–1152, 1153
antiinflammatories, 1153
β-adrenergic blockers, 1152, 1153
carbonic anhydrase inhibitors, 1152, 1153
cholinergics, 1152
cholinesterase inhibitors, 1152
corticosteroids, 1152
direct-acting miotics, 1153–1154
miscellaneous ophthalmics, 1153
mydriatics, 1152
nonsteroidal antiinflammatories, 1152
ophthalmic decongestants/vasoconstrictors, 1153
sympathomimetics, 1152–1153
OPIOID ANALGESICS, 1107
OptiPranolol, 1152
Optivar, 101
Oracea, 332–335
Orajel, 1158
ORAL CONTRACEPTIVES, 239. *See also* CONTRACEPTIVES, HORMONAL
ORAL PROGESTIN, 240
ORAL PROGRESSIVE ESTROGEN, 240
Oraped, 802–805
Oraphen-PD, 7–9
Oravig, 657
Orazinc, 1066
Orbactiv, 735–736
Orencia, 2–4
Orencia ClickJet, 2–4
Orenitram, 1006–1009
Oretic, 489–491
Organidin NR, 479–480
oritavancin, 735–736
Ortho-Cept, 239
Ortho-Cyclen, 240
Ortho Micronor, 240
Ortho-Novum 1/50, 240
Ortho-Novum 7/7/7, 240
Ortho-Novum 10/11, 240
Ortho Tri-Cyclen, 240
Ortho Tri-Cyclen Lo, 240
Os-Cal, 153–154
oseltamivir, 736–738
Osmitrol, 610–612
Otezla, 74–75
OTIC ANTIINFECTIVES, 1160
Otiprio, 1160
Otrexup, 631–636
Ovol, 900
oxaliplatin, 738–740
oxazepam, 740–741
OXcarbazepine, 741–743
Oxecta, 745
Oxeze, 446–448
Oxtellar XR, 741–743
Oxy IR, 745
oxybutynin, 743–744
Oxybutynin (Transdermal), 743–744
oxyCODONE, 745
oxyCODONE/acetaminophen, 745
oxyCODONE/aspirin, 745
oxyCODONE/ibuprofen, 745–747
oxycodone/naltrexone, 747–748
OxyCONTIN, 745
oxymetazoline, 1153, 1154
oxymetazoline hydrochloride, 1158
oxymorphone, 748–749
oxytocin, 750–751
Oxytrol, 743–744
Oxytrol for women, 743–744
Oyado, 745
Ozempic, 1149

## P

Pacerone, 51–53
PACLitaxel, 752
PACLitaxel protein-bound particles, 752–754
Palafer, 422
palbociclib, 754–755
paliperidone, 755–757
palonosetron, 758–759
Pamelor, 718–720
pamidronate, 759–761
Pamprin IB, 504
Pancrease, 761–762
Pancrease-V, 761–762
Pancreaze, 761–762
Pancrecarb MS, 761–762
pancrelipase, 761–762
pancuronium, 762–763
panitumumab, 763–764
Panixine, 175
Panto, 764–766
Pantoloc, 764–766
pantoprazole, 764–766
Paracetamol, 7–9
Paraplatin, 166–169
Parcaine, 1151
parenteral lidocaine, 582–584
Pariet, 838–839
Parlodel, 135–136
PARoxetine, 766–768
Parsabiv, 1135

Parvolex, 11–13
Pataday, 1151
Patanase, 1151, 1154
Paxil, 766–768
Paxil CR, 766–768
Pazeo, 1151
pazopanib, 768–769
PCE, 376
Pedi-Dri, 720–721
PediaCare Children's Allergy, 307–309
PediaCare Nighttime Cough, 307–309
Pediaderm AF, 1156
Pediaderm TA, 1155
Pediaphen, 7–9
Pediatric Videx, 295–297
Pediatrix, 7–9
PedvaxHIB, 1161–1164t
pegaptanib, 769–770
pegfilgrastim, 770–771
pembrolizumab, 773–775
PEMEtrexed, 771–773
Penbritin, 66–68
penciclovir, 1157
penicillin G, 775, 776, 777
penicillin G benzathine, 775, 776, 777
penicillin G potassium, 775, 776
penicillin G procaine, 775–776, 777
penicillin V, 775, 776, 777
Penicillin VK, 775
penicillins, 775–778
Pennsaid, 293
Pentacel, 1161–1164t
Pentam, 778–780
pentamidine, 778–780
Pentasa, 625–626
pentazocine, 780
Pepcid, 412–414
Pepcid AC, 412–414
Pepcid Guard, 412–414
Peptic Relief, 122–124
Pepto-Bismol, 122–124
Percocet, 745
Percodan, 745
Perforomist, 446–448
Periostat, 332–335
Perjeta, 781–782
pertuzumab, 781–782
Pertzye, 761–762
Pexeva, 766–768
Pfizerpen, 775
Pharmorubicin, 360–363
Phazyme, 900
Phenergan, 816–818
phenylephrine, 1152, 1154
Phenytek, 782–785
phenytoin, 782–785
  mechanisms of action, 1181f
Phillips Liquid-Gels, 314–315
Phillips Milk of Magnesia, 608
PhosLo, 153
Phoslyra, 153
Phospho-soda, 907
Photo atlas of drug administration
  administering an injection, 1183f
  deltoid intradermal injection, 1186f
  intradermal injection, 1183f
  IV bolus (push), 1191–1192f
  needle angles, 1190f
  piggyback, 1193f
  subcutaneous injection, 1184f, 1185f
  vastus lateralis intramuscular injection, 1187f
  ventrogluteal intramuscular injection, 1188f
  Z-track method of injection, 1189f
physostigmine, 1152
phytonadione (vitamin $K_1$), 785–786
Piggyback (drug administration), 1193f
pilocarpine, 1152
pimavanserin, 786–788
pimecrolimus, 1158
Pimtrea, 240
Pink Bismuth, 122–124
pioglitazone, 788–789
piperacillin/tazobactam, 789–791
pirfenidone, 792
pitavastatin, 792–793
Pitocin, 750–751
Plan B, 240
Plaquenil, 499–500
Plasbumin-5, 24
Plasbumin-25, 24
Platinol, 214–216
Plavix, 230–231
Pletal, 205–207
PMS, 766–768
PMS-ASA, 83–85
PMS-Buspirone, 145–146
PMS Egozinc, 1066
PMS-Nystatin, 720–721
pneumococcal 7-valent conjugate vaccine, 1161–1164t
pneumococcal vaccine, polyvalent, 1161–1164t
Pneumovax 23, 1161–1164t
poliovirus vaccine (IPV), 1161–1164t
Pontocaine, 1158
Portia, 239
posaconazole, 793–794
Posanol, 793–794
PosiHeparin Lock Flush, 483–487
potassium acetate/potassium bicarbonate, 794
potassium bicarbonate, 794

potassium bicarbonate/potassium citrate, 795
potassium chloride, 794, 795
potassium gluconate, 795–796
Potassium-Rougier, 795–796
Pradaxa, 255–256
Praluent, 29–30
pramipexole, 796–797
pramlintide, 797–799
pramoxine, 1158
Prandase, 5–7
Prandin, 853–854
prasugrel, 799–800
Pravachol, 800–801
PravASA, 800–801
pravastatin, 800–801
Prax, 1158
prazosin, 801–802
Precose, 5–7
Pred-Forte, 802–805, 1152
Pred Mild, 1152
prednisoLONE, 802–805, 1152
predniSONE, 805–807
Prednoral, 802–805
pregabalin, 807–808
Prelone Millipred, 802–805
Premarin, 389
Prepidil, 305–306
Pressyn, 1029–1030
PresTab, 473–474
Prevacid, 560–561
Prevacid SoluTab, 560–561
Prevalite, 202–204
Previfem, 240
Prevnar, 1161–1164t
Prevymis, 1141
PriLOSEC OTC, 732–733
Primatene Mist, 357
Primaxin IM, 514–517
Primaxin IV, 514–517
primidone, 808
Pristiq, 284–285
ProAir HFA, 24–27
ProAir RespiClick, 24–27
procainamide, 808–811
ProcalAmine, 50–51
Procan SR, 808–811
procarbazine, 811–812
Procardia, 707–709
Procardia XL, 707–709
Prochlorazine, 812–814
prochlorperazine, 812–814
Procrit, 364–367
Proctofoam, 1158
Procytox, 247–249
Profen, 504
progesterone, 814–816
PROGESTIN, ORAL, 240
Prograf, 934
PROGRESSIVE ESTROGEN, ORAL, 240
Prolensa, 1152
Prolia, 278–280
Promacta, 343
Promethegan, 816–818
promethazine, 816–818
Prometrium, 814–816
propafenone, 818–819
proparacaine, 1151
Propecia, 428–429
propofol, 819–821
propranolol, 821–823
Propyl-Thyracil, 823–825
propylthiouracil, 823–825
ProQuad, 1161–1164t
Proscar, 428–429
Prostin E-Z, 305–306
protamine, 825–826
Protin DF, 925–927
Protonix, 764–766
Protonix IV, 764–766
Protopic, 934–937
Proventil, 24–27
Proventil HFA, 24–27
Provera, 613–615
Provigil, 674–675
PROzac, 437–439
PROzac Weekly, 437–439
PRP-OMP, 1161–1164t
Prudoxin Cream, 325–327
pseudoephedrine, 826
psyllium, 827–828
Pulmicort, 136–138
Pulmicort Flexhaler, 136–138
Pulmicort Respules, 136–138
Pulmicort Turbohaler, 136–138
Purinol 1, 31–33
pyridostigmine, 828–829
pyridoxine (vitamin $B_6$), 829

## Q

Q-Dryl Allergy, 307–309
Q-Pap, 7–9
Q-Pap Children's, 7–9
Qnasl, 1154
Quadracel, 1161–1164t
Quasense, 239
Qudexy XR, 993–995
Quelicin, 923–924
Questran, 202–204
Questran Light, 202–204
QUEtiapine, 831–833
QuillChew, 641–645
Quillivant XR, 641–645

quinapril, 833–835
quiNIDine gluconate, 835
quiNIDine sulfate, 835–837
QVAR, 108

## R

RabAvert, 1161–1164t
RABEprazole, 838–839
rabies vaccine, human diploid cell (HDCV), 1161–1164t
Radicava, 1134
Radiostol, 1051–1052
Radiostol Forte, 1051–1052
raloxifene, 839–840
raltegravir, 840–841
ramelteon, 842–843
ramipril, 843–844
RAN-Fentanyl, 418
Ranexa, 847–849
ranibizumab, 844–845
Raniclor, 178
ranitidine, 845–847
ranolazine, 847–849
Rapaflo, 897–898
Rapamune, 901–903
Rapid Action Relief, 7–9
rasagiline, 849–850
rasburicase, 850–851
Rasilez, 30–31
Rasuvo, 631–636
Rayos, 805–807
Razadyne, 460–461
Razadyne ER, 460–461
Reactine, 194–195
Rebif, 528
Reclast, 1070–1071
Reclipsen, 239
Recombivax HB, 1161–1164t
Rectiv, 713
Redutemp, 7–9
Refissa, 1157
Reglan, 647–649
Regonol, 828–829
regorafenib, 851–853
regular insulin (ketoacidosis), 525
Reguloid, 827–828
Relenza, 1063
ReliOn, 24–27
ReliOn 70/30, 524
ReliOn N, 524
ReliOn R, 524
Relistor, 640–641
Relpax, 342–343
Remeron, 667–669
Remeron Soltab, 667–669
Remicade, 522–524
Reminyl, 460–461
Remodulin, 1006–1009
Remsima, 522–524
Ren Amin, 50–51
Renedil, 415–416
Renova, 1009–1010, 1157
repaglinide, 853–854
Repatha, 407–408
Reprexain, 491–494
Requip, 878–880
Requip XL, 878–880
Rescriptor, 277–278
Rescula, 1153
Resectisol, 610–612
Restoril, 947–949
retapamulin, 1157
Retin-A, 1009–1010, 1157
Retin-A Micro, 1009–1010
retinoic acid, 1009–1010
Retrovir, 1064–1066
Revatio, 895–897
Revitonus, 967
Revonto, 267–268
Rexulti, 1122–1123
Reyataz, 85–87
$Rh_0$ (D) immune globulin, microdose IM, 854
$Rh_0$ (D) immune globulin, microdose (IM, IV), 854
$Rh_0$ (D) immune globulin, standard dose IM, 854
$Rh_0$ (D) immune globulin IV, 854–856
Rheumatrex, 631–636
Rhinocort Aqua, 136–138, 1154
rho Gam Ultra Filtered Plus, 854
Rho-Nitro, 713
Rhofade, 1158
Rhophylac, 854–856
rhu GM-CSF, 887–889
ribavirin, 856–857
ribociclib, 1145–1147
riboflavin (vitamin $B_2$), 857
Ridenol, 7–9
rifabutin, 857–859
Rifadin, 859–860
rifampin, 859–860
rifaximin, 860–861
rilpivirine, 861–863
Rilutek, 863
riluzole, 863
rimexolone, 1152
Riomet, 626–628
Riopan, 607
Riopan Extra Strength, 607
risedronate, 863–864
RisperDAL, 864–867
Risperdal Consta, 864–867

Risperdal M-TAB, 864–867
risperiDONE, 864–867
Ritalin, 641–645
Ritalin LA, 641–645
Ritalin SR, 641–643
ritonavir, 867–869
Rituxan, 869–871
riTUXimab, 869–871
rivaroxaban, 871–874
Rivasa, 83–85
rivastigmine, 874–875
Rivotril, 226–228
rizatriptan, 875–876
Robafen Cough Gels, 289–290
Robidone, 491
Robigesic, 7–9
Robitussin, 289–290
Robitussin Cough with Honey, 289–290
Robitussin GuaiFENesin, 479–480
Robitussin Long-Acting Cough, 289–290
Rocaltrol, 151–152
Rocephin, 183
Rofact, 859–860
roflumilast, 876–877
Rogaine (TOP), 665–666
Rolaids Extra Strength Soft-chew, 153–154
Romazicon, 433–434
romiPLOStim, 877–878
Romycin, 1151
rOPINIRole, 878–880
ropivacaine, 880–881
Rosadan, 1157
rosiglitazone, 881–882
rosuvastatin, 882–884
Rotarix, 1161–1164t
RotaTeq, 1161–1164t
rotavirus vaccine, 1161–1164t
Rounox, 7–9
Rowasa, 625–626
Roxicet, 745
Rozerem, 842–843
Rubesol-1000, 1049–1050
Rubramin PC, 1049–1050
rufinamide, 884–885
Ryanodex, 267–268
Rydapt, 1143
Rylosol, 917–919
Rytary, 572–575
Rythmol, 818–819
Rythmol SR, 818

## S

Sabril, 1038–1039
Safe medication administration guide, 1227
safinamide, 1147–1149
Safyral, 239
Saizen, 913–917
Salacyn, 1157
Salazopyrin, 927–929
Salazopyrin EN-tabs, 927–929
Salbutamol, 24–27
SALICYLATES, 1107–1108
salicylic acid, 1157
salmeterol, 886–887
Salofalk, 625–626
Salvax, 1157
Samsca, 992–993
Sanctura, 1016–1017
Sanctura XR, 1016–1017
Sancuso, 477–479
SandIMMUNE, 249
SandoSTATIN, 724–726
Sandostatin LAR Depot, 724–726
Sandoz Diclofenac, 293
Saphris, 81–83
Sarafem, 437–439
sargramostim, 887–889
Sarna HC, 1155
saxagliptin, 889–890
Saxenda, 589–591
scopolamine, 890–891
Scot-Tussin Diabetes CF, 289–290
Scot-Tussin Expectorant, 479–480
Seasonale, 240
Seasonique, 239
Sebivo, 945–946
secnidazole, 1149
secukinumab, 891
SEDATIVES/HYPNOTICS, 1108–1109
Select Brand Allergy, 307–309
selegiline, 892–893
selenium, 1156
Selex, 314–315
Sellymin, 905–907
semaglutide, 1149
Sensipar, 209–210
Septra, 925–927
Septra DS, 925–927
Serax, 740–741
Serevent, 886–887
Serevent Diskus, 886–887
SEROquel, 831–833
Seroquel XR, 831–833
Serostim, 913–916
Serostim LQ, 916
Sertan, 808
sertraline, 893–895
SF Rowasa, 625–626
Shingrix, 1161–1164t
Shovite, 1049–1050
Silace, 314–315
Siladryl, 307–309

Silapap, 7–9
sildenafil, 895–897
Silenor, 325–327
Siliq, 1125–1126
Silkis, 151–152
silodosin, 897–898
Silphen, 307–309
Siltussin DAS, 479–480
Siltussin SA, 479–480
Silvadene SSD, 1157
silver nitrate, 1151
silver nitrate 1%, 1151
silver sulfADIAZINE, 1157
simeprevir, 898–900
simethicone, 900
Simponi, 475–476
Simponi Aria, 475–476
Simulect, 107–108
simvastatin, 900–901
Sinemet, 572–575
Sinemet CR, 572–575
SINEquan, 325–327
single chain antihemophilic factor recombinant, 74
Singulair, 675–677
sirolimus, 901–903
sitaGLIPtin, 904–905
Sitavig, 13–15
Sites of action. *See* Illustrated mechanisms and sites of action
SKELETAL MUSCLE RELAXANTS, 1109
Skyla, 240
Slo-Niacin, 703
SMZ/TMP, 925–927
sodium bicarbonate, 905–907
sodium biphosphate/sodium phosphate, 907
sodium polystyrene sulfonate, 907–909
Soflax, 314–315
Soflax-Ex, 121–122
sofosbuvir, 909–910
sofosbuvir/velpatasvir, 910–911
Solaraze Topical Gel, 293
Solarcaine, 1158
Solia, 239
solifenacin, 912–913
Soliqua, 528
Solodyn, 663–665
Solosec, 1149
Soltamox, 938–940
Solu-Cortef, 494–497
Solu-MEDROL, 645–647
Soma, 169–170
somatropin, 913–917
Sominex, 307–309
Sonata, 1061–1063
sonidegib, 917, 1149
Sorine, 917–919
sotalol, 917–919
Sotylize, 917–919
Sovaldi, 909–910
Spectracef, 183
Spiriva, 977–978
Spiriva Respimat, 977–978
spironolactone, 919–921
Spirtam, 571–572
Sprintec, 240
Sprix, 549–551, 1154
SPS, 907–909
Sronyx, 239
St. Joseph Adult, 83–85
St. Joseph Children's, 83–85
Stadol, 147–149
Standard Precautions, 1169
Statex, 677–683
stavudine d4t, 921–923
Staxyn, 1027–1028
Steglatro, 1135
STEROIDS
  corticosteroids, 1101–1102, 1152
  nasal, 1154
  topical glucocorticoids, 1155–1156
Stieva-A, 1009–1010
Stimate, 282–284
Stivarga, 851–853
StomaK-care, 122–124
Strattera, 91–92
Striant, 961
Subcutaneous injection, 1184f, 1185f
Sublimaze, 418
Subsys, 418
Subutex, 141–143
succinylcholine, 923–924
sucralfate, 924–925
Sudafed, 826
Sudafed 24 hour, 826
Sudogest, 826
Sulcrate, 924–925
sulfacetamide sodium, 1151
sulfamethoxazole/trimethoprim, 925–927
Sulfamylon, 1157
sulfaSALAzine, 927–929
Sultrex, 925–927
SUMAtriptan, 929–930
Sumavel Dose Pro, 929–930
SUNItinib, 930–932
Supeudol, 745
Suprax, 183
Sustiva, 341–342
Sustol, 477–479
Sutent, 930–932
suvorexant, 932–933
swine flu vaccine, 1161–1164t
Syeda, 239

SymlinPen, 797–799
Symmetrel, 42–44
SYMPATHOLYTICS (sites of action), 1182f
SYMPATHOMIMETICS, 1152–1153
Syn-Nadol, 688–689
Synalar, 1155
Synthroid, 580–582
Syntocinon, 750–751
SYSTEMIC ANTIFUNGALS, 1087

## T

T-Painol, 7–9
Tab-Profen, 504
Tac-3, 1010–1013
Tac-40, 1010–1013
tacrolimus, 934
tacrolimus (topical), 934–937
tadalafil, 937–938
Tafinlar, 256–258
Tagamet, 207–209
Tagamet HB, 207–209
Talwin, 780
Talwin NX, 780
Tamiflu, 736–738
Taminol, 7–9
Tamofen, 938–940
Tamone, 938–940
Tamoplex, 938–940
tamoxifen, 938–940
tamsulosin, 940–941
Tanzeum, 22–24
Tapanol, 7–9
Tapazole, 630–631
tapentadol, 941–942
Tarceva, 372–374
Tarka, 1035–1038
Tasigna, 709–710
tasimelteon, 942
Tasmar, 990–991
tavaborole, 1156
Taxol, 752
Taxotere, 311–314
Tazicef, 183
Tazocin, 789–791
Taztia XT, 302–304
Tecentriq, 91
Tecta, 764–766
teduglutide, 943
Teflaro, 172–173
TEGretol, 164–166
TEGretol-XR, 164–166
Tegrol-CR, 164–166
Tekturna, 30–31
telavancin, 943–945
telbivudine, 945–946
telmisartan, 946–947
temazepam, 947–949
Temodar, 949–950
Temovate, 1155
temozolomide, 949–950
Tempra, 7–9
temsirolimus, 950
tenecteplase (TNK-tPA), 951–952
Tenivac, 1161–1164t
tenofovir, 952–953
Tenolin, 89–90
Tenormin, 89–90
Terazol 3, 1159
Terazol 7, 1159
terazosin, 953–954
terbinafine, 1156
terbinafine, oral, 955–956
terbutaline, 956–957
terconazole, 1159
teriflunomide, 957–958
Teril, 164–166
teriparatide, 958–959
tesamorelin, 959–960
Testim, 961
Testopel, 961
testosterone, 960
testosterone buccal, 961
testosterone cypionate, 960
testosterone enanthate, 960
testosterone gel, 961
testosterone nasal gel, 961–963
testosterone pellets, 961
testosterone topical solution, 961
testosterone transdermal, 961
testosterone undecanoate, 960
tetanus toxoid, adsorbed, 1161–1164t
tetracaine, 1151, 1158
Tetracaine, 1151
tetracycline, 963–965
tetrahydrozoline, 1153, 1154
TetraVisc, 1151
Teveten, 367–368
TH Naproxen, 695–697
Theo-24, 965–967
Theochron, 965–967
theophylline, 965–967
Thermazene, 1157
Thiamilate, 967
thiamine (vitamin $B_1$), 967
thioridazine, 967–968
Thrive, 705
THROMBOLYTICS, 1109–1110
THYROID HORMONES, 1110–1111
thyroid USP (desiccated), 968
tiaGABine, 968–969
Tiamate, 302–304
Tiazac, 302–304
ticagrelor, 969–970

TICE BCG, 1161–1164t
ticlopidine, 971–972
Tigan, 1014–1015
tigecycline, 972–974
Tikosyn, 315–317
timolol, 974–975, 1152
Tindamax, 975–976
Ting, 1156
tinidazole, 975–976
tioconazole, 1159
tiotropium, 977–978
tipranavir, 978–979
tirofiban, 979–981
Tirosint, 580–582
tisagenlecleucel, 1149
Tivicay, 318–319
Tivorbex, 521–522
tiZANidine, 981–982
TNK-tPA, 951–952
TNKase, 951–952
TOBI, 982–985
TOBI Podhaler, 982–985
tobramycin, 982–985, 1151
Tobrasol, 1151
Tobrex, 1151
tocilizumab, 985–988
tofacitinib, 988–990
Tofranil, 517–519
Tofranil PM, 517–519
Tolak, 434–437
tolcapone, 990–991
tolnaftate, 1156
Toloxin, 298–302
tolterodine, 991–992
tolvaptan, 992–993
Topamax, 993–995
Topamax Sprinkle, 993–995
TOPICAL ANESTHETICS, 1158
TOPICAL ANTIFUNGALS, 1156–1157
TOPICAL ANTIINFECTIVES, 1157
TOPICAL ANTIVIRALS, 1157–1158
TOPICAL GLUCOCORTICOIDS, 1155–1156
TOPICAL MISCELLANEOUS, 1158–1159
Topicort, 1155
topiramate, 993–995
topotecan, 995–997
Toprol-XL, 651–653
Topsyn, 1155
Toradol, 549–551
toremifene, 997
Torisel, 950
Toujeo Solostar, 524
Toviaz, 423–424
Toxoids and vaccines, 1161–1164t
Tr-Immunol, 1161–1164t
Tracleer, 131–132
Tradjenta, 585–586
Trajenta, 585–586
traMADol, 997–999
trametinib, 999–1000
Trandate, 552–554
trandolapril, 1000–1002
Transderm-Scop, 890–891
TRANSDERMAL CONTRACEPTIVES, 240
trastuzumab, 1002–1005
Travasol, 50–51
Travatan, 1153
travoprost, 1153
traZODone, 1005–1006
Treanda, 116–117
Trelstar, 1015–1016
Trelstar Depot, 1015–1016
Trelstar LA, 1015–1016
Tremfya, 1135–1136
Tremytoine, 782–785
treprostinil, 1006–1009
Tresiba, 524
Tretin-X, 1157
tretinoin, 1157
tretinoin (vitamin A acid, retinoic acid), 1009–1010
Trexall, 631–636
Tri-E Starylla, 240
Tri-Levlen, 240
Tri-Linyah, 240
Tri-Norinyl, 240
triamcinolone, 1010–1013, 1154, 1155
Triaminic Allerchews, 597–598
Triaminic Long-Acting Cough, 289–290
Trianide, 1155
triazolam, 1013–1014
Tricor, 416–417
Triderm, 1155
Triesence, 1010–1013
trifluridine, 1152
Triglide, 416–417
Trileptal, 741–743
trimethobenzamide, 1014–1015
Trinipatch, 713
TRIPHASIC CONTRACEPTIVES, 240
Triphasil, 240
Triple Paste AF, 1156
TripTone, 304–305
triptorelin, 1015–1016
Trokendi XR, 993–995
TrophAmine, 50–51
trospium, 1016–1017
Troxyca ER, 747–748
Trulicity, 336–337
Trusopt, 1152
Tums, 153–154
Tums Dissolve, 153–154
Tums E-X, 153–154
Tums Kids, 153–154

Tums Lasting Effects, 153–154
Tums Smoothies, 153–154
Tums Ultra, 153–154
Twinject, 357
Tygacil, 972–974
Tykerb, 562
Tylenol, 7–9
Tymlos, 1113–1114
Typhim Vi, 1161–1164t
typhoid vaccine, oral, 1161–1164t
typhoid vaccine, parenteral, 1161–1164t
typhoid Vi polysaccharide vaccine, 1161–1164t
Tyvaso, 1006–1009
Tyzeka, 945–946
Tyzine, 1154
Tyzine Pediatric, 1154

## U

Uceris, 136–138
Ulcidine, 412–414
ulipristal, 1018
Uloric, 414–415
Ultradol, 395–397
Ultram, 997–999
Ultram ER, 997–999
UltraSal-ER, 1157
Ultrase, 761–762
Ultrase MT, 761–762
Unasyn, 68–70
undecylenic acid, 1156
Uni-Ace, 7–9
Unicort, 1155
Unipen, 689–691
Uniphyl, 965–967
Unisom, 307–309
Unithroid, 580–582
unoprostone, 1153
Uro-Mag, 608
Uromax, 743–744
Uroxatral, 28–29
Urozide, 489

## V

Vabomere, 1141–1142
Vaccines and toxoids, 1161–1164t. *See also* Immunization Schedules
Vagifem Dot, 386
VAGINAL ANTIFUNGALS, 1159–1160
VAGINAL RING, 240
Vagistat 1, 1159
Vagistat 3, 657–659
valACYclovir, 1019–1020
valbenazine, 1150
Valcyte, 1020–1021
valGANciclovir, 1020–1021
Valium, 290–293
valproate, 1021
valproic acid, 1021
valsartan, 1023–1025
Valtrex, 1019–1020
Valtropin, 916
Valu-Dryl, 307–309
Vancocin, 1025–1027
vancomycin, 1025–1027
Vantin, 183
Vaprisol, 238–239
VAQTA, 1161–1164t
vardenafil, 1027–1028
varenicline, 1028–1029
Varicella-Zoster Virus Vaccine, 1161–1164t
Varivax, 1161–1164t
VASODILATORS, 1111–1112
vasopressin, 1029–1030
Vasostrict, 1029–1030
Vastus lateralis intramuscular injection, 1187f
VCR, 1043–1045
Vectibix, 763–764
Vectical, 151–152
vedolizumab, 1030–1031
Velbe, 1041–1043
Velcade, 129–131
Velivet, 239
Velivel Triphasic, 239
Velphoro, 540–541
vemurafenib, 1031–1033
Venclexta, 1033
venetoclax, 1033
venlafaxine, 1033–1035
Venofer, 540–541
Ventolin HFA, 24–27
Ventrogluteal intramuscular injection, 1188f
Veramil, 1035–1038
Veramyst, 440–442, 1154
verapamil, 1035–1038
Verazinc, 1066
Verdeso Foam, 1155
Verelan, 1035–1038
Verelan PM, 1035–1038
Veripred, 802–805
Versacloz, 231–234
Verzenio, 1114–1116
VESIcare, 912–913
Vesotec, 349–351
Vestura, 239
Vexol, 1152
Vfend, 1054–1057
Viagra, 895–897
Vibativ, 943–945
Vibra-Tabs, 332–335

Vibral, 1049–1050
Vibral LA, 1049–1050
Vibramycin, 332–335
Vicks Custom Care Body Aches, 7–9
Vicks DayQuil Mucus Control, 479–480
Vicks Formula 44 Cough Relief, 289–290
Vicks QlearQuil, 1154
Vicks Sinex, 1154
Vicoprofen, 491–494
Victoza, 589–591
Vidaza, 98–99
Videx EC, 295–297
Vienva, 239
vigabatrin, 1038–1039
Vigamox, 683–685, 1151
Viibryd, 1039–1040
vilazodone, 1039–1040
Vimpat, 554–555
vinBLAStine (VLB), 1041–1043
vinCRIStine (VCR), 1043–1045
vinorelbine, 1045–1046
VioKase, 761–762
Viorelle, 239, 240
Viracept, 700–701
Viractin, 1158
Viramune, 701–703
Viramune XR, 701–703
Virazole, 856–857
Viread, 952–953
Viroptic, 1152
Visine L.R., 1153
Visine Original, 1153
vismodegib, 1046–1047
Vistaril, 500–501
Vistide, 204–205
vitamin A, 1047–1049
Vitamin A, 1047–1049
vitamin A acid, 1009–1010
vitamin $B_1$, 967
vitamin $B_2$, 857
vitamin $B_6$, 829–830
vitamin $B_9$, 443–445
Vitamin $B_{12}$, 1049–1050
vitamin $B_{12}$ (cyanocobalamin), 1049
vitamin $B_{12}$a (hydroxocobalamin), 1049–1050
vitamin C (ascorbic acid), 1050–1051
vitamin $D_2$, 1051–1052
vitamin $D_3$, 1051–1052
vitamin D (cholecalciferol), 1051–1052
vitamin E, 1052–1053
vitamin $K_1$, 785–786
VITAMINS, 1112
Vitrasert, 461–463
Vivelle, 386
Vivotif Berna Vaccine, 1161–1164t
VLB, 1041–1043
Vogelxo, 961
Volibris, 44
Voltaren, 293
Voltaren Rapide, 293
Voltaren XR, 293
Voltram Topical Gel, 293
vorapaxar, 1053–1054
voriconazole, 1054–1057
vortioxetine, 1057–1058
Vospire ER, 24–27
Votrient, 768–769
Vyxeos, 1130
Vyzulta, 1153

## W

Wal-Dram, 304–305
Wal-dryl Allergy, 307–309
Wal-dryl Allergy Dye Free, 307–309
Wal-dryl Children's Allergy, 307–309
Wal-Mucil, 827–828
Wal-Tussin, 289–290
Walgreens Acetaminophen, 7–9
Walgreens Aspirin Adult, 83–85
Walgreens Bronchial Mist, 357
Walgreens Finest B-6, 829–830
Walgreens Gold Seal, 1050–1051
Walgreens Gold Seal Vitamin $B_6$, 829–830
Walgreens Non-Aspirin, 7–9
warfarin, 1059–1060
Warfilone, 1059–1060
Welchol, 237–238
Wellbutrin, 143–145
Wellbutrin SR, 143–145
Wellbutrin XL, 143–145
Winpreo, 805–807
WinRho SDF, 854

## X

Xadago, 1147–1149
Xalatan, 1153
XALKORI, 242–245
Xanax, 36–38
Xanax XR, 36–38
Xarelto, 871–874
Xartemis XR, 745
Xatmep, 631–636
Xatral, 28–29
Xeljanz, 988–990
Xeloda, 160–162
Xgeva, 278–280
Xifaxan, 860–861
Xolair, 731–732
Xolegel, 1156
Xopenex, 569–570
Xopenex HFA, 569–570

XS Pain Reliever, 7–9
Xtampza, 745
Xtampza ER, 745–746
Xtandi, 357
Xultophy, 528
Xylocaine, 582–584
Xylocard, 582

## Y

Yaela, 239
Yasmin, 239
Yaz 28, 239
yellow fever vaccine, 1161–1164t
Yervoy, 533–534
Yescarta, 1118–1121
YF-Vax, 1161–1164t
Yosprala, 85
Yulane, 240

## Z

Z-track method of injection, 1189f
Zaditor, 1151
zafirlukast, 1061
zaleplon, 1061–1063
Zaltrap, 1068–1070
Zanaflex, 981–982
zanamivir, 1063
Zantac, 845–847
Zantac-C, 845–847
Zantac EFFER-dose, 845–847
Zarah, 239
Zarxio, 426–428
Zazole, 1159
Zeasorb-AF, 1156
Zecuity, 929–930
Zejula, 1145
Zelapar, 892–893
Zelboraf, 1031–1033
Zeldox, 1066–1068
Zenpep, 761–762
Zerit, 921–923
Zerviate, 1151
Zestril, 591–593
Zetia, 409
Ziagen, 1–2
zidovudine, 1064–1066
Zilactin-L, 1158
Zinacef, 179
Zinbryta, 262–263
zinc, 1066
Zinc 15, 1066
Zinc-220, 1066
Zinca-Pak, 1066
Zincate, 1066
Zinplava, 120–121
ziprasidone, 1066–1068
Zipsor, 293
Zirgan, 461–463, 1151
Zithromax, 102–105
ziv-aflibercept, 1068–1070
Zmax, 102–105
Zocor, 900–901
Zofran, 734–735
Zofran ODT, 734–735
Zohydro ER, 491
Zoladex, 476
zoledronic acid, 1070–1071
ZOLMitriptan, 1072–1073
Zoloft, 893–895
zolpidem, 1073–1074
Zolpimist, 1073–1074
Zomacton, 913–917
Zometa, 1070–1071
Zomig, 1072–1073
Zomig-ZMT, 1072–1073
Zonegran, 1074–1075
zonisamide, 1074–1075
Zonolon Topical Cream, 325–327
Zontivity, 1053–1054
Zopex, 740–741
Zorbtive, 913–917
Zortress, 398–407
Zorvorex, 293–295
Zostavax, 1161–1164t
Zoster vaccine recombinant, adjuvanted, 1161–1164t
Zosyn, 789–791
Zovia 1/35, 239
Zovia 1/50, 239
Zovirax, 13–15
Zovirax Topical, 1157
Zuplenz ODF, 734–735
Zyban, 143–145
Zykadia, 191–192
Zyloprim, 31–33
Zymaxid, 1151
ZyPREXA, 726–728
Zyprexa Intramuscular, 726–728
Zyprexa Relprevv, 726–728
Zyprexa Zydis, 726–728
ZyrTEC, 194–195
ZyrTEC Itchy Eye, 1151
Zytiga, 4–5
Zytram, 997–999
Zyvox, 587–589
ZzzQuil, 307–309

This page intentionally left blank

This page intentionally left blank

This page intentionally left blank

This page intentionally left blank

This page intentionally left blank

This page intentionally left blank

This page intentionally left blank

This page intentionally left blank

This page intentionally left blank

This page intentionally left blank

This page intentionally left blank

This page intentionally left blank

This page intentionally left blank

- Does the patient have any allergies?
- Is the patient NPO?
- Is the patient taking any other medication and/or herbal supplements that may interact with this drug?
- Are there any vital signs that I need to check before administering the drug?
- Do I need to check any lab values (i.e., glucose)?
- Are there any other assessments that I need to make before giving this drug?

## The 5 rights of medication administration

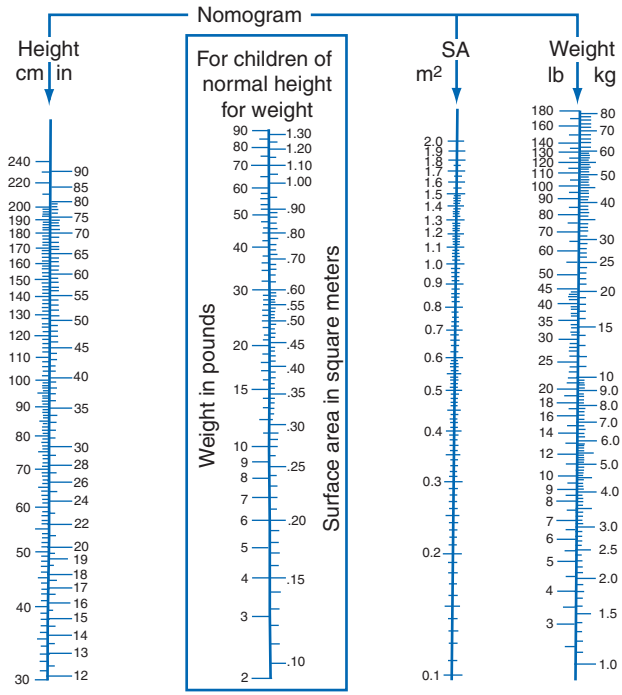
Always adhere to the 5 rights of medication administration when transcribing, preparing, administering, and documenting medications:

1. **Right patient:** Compare the patient's armband with the medication administration record. Compare the patient's name on the medication administration record (MAR) with that on the medication drawer or computerized equipment.
2. **Right drug:** Verify the correct medication by comparing the name on the label on the drug container with that written on the MAR.
3. **Right route:** Check the ordered route by reading the medication order, and verify the appropriateness of the route based on knowledge of the patient's condition.
4. **Right dose:** Always independently double-check dosages of medications with the pharmacy's calculations or with a second nurse. The nurse must also be aware of therapeutic dosages for each medication and question an order that is not within that range.
5. **Right time:** All medications should be administered within 30 minutes of the scheduled time. The medications must also be prepared to correlate appropriately with meal times and to avoid drug interactions.

Following appropriate drug administration, assess the patient for the expected therapeutic outcome and/or potential side effects.

## Nomogram for Calculation of Body Surface Area

Place a straight edge from the patient's height in the left column to his or her weight in the right column. The point of intersection on the body surface area column indicates the body surface area (BSA). (Reproduced in Behrman RE, Kliegman RM, Jenson HB: *Nelson Textbook of Pediatrics,* ed 18, Philadelphia, 2007, WB Saunders; nomogram modified from data of E. Boyd by CD West.)




Alternative (Mosteller's formula):

$$\text{Surface area } (m^2) = \sqrt{\frac{\text{Height (cm)} \times \text{Weight (kg)}}{3600}}$$

Surface area rule:

$$\text{Child dose} = \frac{\text{Surface area } (m^2)}{1.73\ m^2} \times \text{Adult dose}$$

BMI formula:

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height } (m^2)}$$

## Syringe Compatibility

| | Atropine | Buprenorphine | Butorphanol | ChlorproMAZINE | Codeine | Diazepam | DimenhyDRINATE | DiphenhydrAMINE | Droperidol | Fentanyl | Glycopyrrolate | Heparin |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Atropine | | | C | C | | I | C | C | C | C | C | |
| Buprenorphine | | | | | | | | | | | | |
| Butorphanol | C | | | C | | I | I | C | C | C | | |
| ChlorproMAZINE | C | | C | | | I | I | C | C | C | C | C |
| Codeine | | | | | | I | | | | | | |
| Diazepam | I | | I | I | I | | I | I | I | I | I | |
| DimenhyDRINATE | C | | I | I | | I | | C | C | C | I | |
| DiphenhydrAMINE | C | | C | C | | I | C | | C | C | C | |
| Droperidol | C | | C | C | | I | C | C | | C | C | I |
| Fentanyl | C | | C | C | | I | C | C | C | | C | |
| Glycopyrrolate | C | | | C | | I | I | C | C | C | | |
| Heparin | | | I | C | | I | | | I | | | |
| HydrOXYzine | C | | C | C | | I | I | C | C | C | C | |
| Meperidine | C | | C | C | | I | C | C | C | C | C | I |
| Metoclopramide | C | | C | C | | I | C | C | C | C | | |
| Midazolam | C | | C | C | | | I | C | C | C | C | |
| Morphine | C | | C | C | | I | C | C | C | C | C | I |
| Nalbuphine | C | | | | | I | | | C | | | |
| Pentazocine | C | | C | C | | I | C | C | C | C | I | I |
| Pentobarbital | C | | I | I | I | I | I | I | I | I | I | |
| Perphenazine | C | | C | C | | I | C | C | C | C | | |
| Prochlorperazine | C | | C | C | | I | I | C | C | C | C | |
| Promazine | C | | | C | | I | I | C | C | C | C | |
| Promethazine | C | | C | C | | I | I | C | C | C | C | |
| Ranitidine | C | | | C | | | C | C | | C | C | |
| Scopolamine Hbr | C | | C | C | | I | C | C | C | C | C | |
| Secobarbital | I | | I | I | I | I | I | I | I | I | I | |
| Thiethylperazine | | | C | | | I | | | | | | |

Developed by Providence Memorial Hospital, El Paso, Texas.
NOTE: Give within 15 minutes of mixing.
C = compatible; I = incompatible; □ = no documented information.
* = compatibility depends on manufacturer, Wyeth and DuPont forms are incompatible.

| | HydrOXYzine | Meperidine | Metoclopramide | Midazolam | Morphine | Nalbuphine | Pentazocine | Pentobarbital | Perphenazine | Prochlorperazine | Promazine | Promethazine | Ranitidine | Scopolamine Hbr | Secobarbital | Thiethylperazine |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | C | C | C | C | C | C | C | C | C | C | C | C | C | C | I | |
| | | | | | | | | | | | | | | | | |
| | C | C | C | C | C | | C | I | C | C | | C | | C | I | C |
| | C | C | C | C | C | | C | I | C | C | C | C | C | C | I | |
| | | | | | | | | I | | | | | | | I | |
| | I | I | I | | I | I | I | I | I | I | I | I | | I | I | I |
| | I | C | C | I | C | | C | I | C | I | I | I | C | C | I | |
| | C | C | C | C | C | | C | I | C | C | C | C | C | C | I | |
| | C | C | C | | C | C | C | I | C | C | C | C | | C | I | |
| | C | C | C | | C | | C | I | C | C | C | C | C | C | I | |
| | C | C | | | C | | I | I | | C | C | C | C | C | I | |
| | | I | | | I | | I | | | | | I | | | | |
| | | C | C | | C | C | C | I | | C | C | C | I | C | I | |
| | C | | C | | I | | C | I | C | C | C | C | C | C | I | |
| | C | C | | | C | | C | | C | C | C | C | C | C | I | |
| | C | | C | | C | C | | I | I | I | C | C | I | C | | C |
| | C | I | C | | | | C | I | C | C | C | C | C | C | I | |
| | C | | | | | | | I | | C | | * | C | C | I | C |
| | C | C | C | | C | | | I | C | C | C | C | C | C | I | |
| | I | I | | | I | I | I | | I | I | I | I | | C | I | |
| | | C | C | | C | | C | I | | C | | C | C | C | I | I |
| | C | C | C | | C | C | C | I | C | | C | C | C | C | I | |
| | C | C | C | | C | | C | I | | C | | C | | C | I | |
| | C | C | C | | C | C | C | I | C | C | C | | C | C | I | |
| | | C | C | I | C | C | C | | C | C | | C | | C | | C |
| | C | C | C | | C | C | C | C | C | C | C | C | C | | I | |
| | I | I | I | | I | I | I | I | I | I | I | I | | I | | I |
| | | | | | | C | | | I | | | | C | | I | |

Parenteral compatibility occurs when two or more drugs are successfully mixed without liquefaction, deliquescence, or precipitation.